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A FLORA OF SANTA CATALINA ISLAND, CALIFORNIA

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INTRODUCTION

LOCATION AND TOPOGRAPHY

Santa Catalina Island, part of Los Angeles County, is the largest (about 75 square miles) of the southern group of California Channel Islands. Mt. Orizaba, the highest point on the island (2069 ft.) and also near its center, lies at $33^{\circ} 22.5'$ N latitude, $118^{\circ} 25'$ W longitude. Santa Catalina is also the closest of the southern group to the coast, 20 statute miles S from Pt. Vicente on Palos Verdes Peninsula. Avalon, on the island's SE end and its only town, is approximately 31 miles S of Long Beach, 50 miles S of the Civic Center of Los Angeles, and 81 miles NW of San Diego. The nearest island is San Clemente Island, about 21 miles to the S at the nearest point. Santa Cruz Island lies about 65 miles NW and Guadalupe Island, off Baja California, about 280 miles due south.

Santa Catalina Island is about 22 miles long, with the long axis running SE to NW, more or less parallel to the mainland. It is about 8 miles wide near its center and 3 miles wide at various narrow points. The Isthmus, however, is less than a half mile wide and about 20 ft. above high tide level. The island is mountainous and rugged, traversed along its main axis by a high ridge generally about 1500 ft. high. Only at the Isthmus, about 7 miles from the NW end of the island, is this ridge broken due to a structural sag with faulting and subsequent erosion (Smith, 1933).

The two highest mountains are Mt. Orizaba, formerly 2089 ft. before the Federal Aviation Agency levelled off 20 ft. in 1960 to install Air Navigation facilities, and Black Jack Mt., 2010 ft. and site of radar storm detection units (Overholt, 1962). Superimposed upon the mature topography of the summit ridge and other high points is the youthful topography represented by deep, V-shaped canyons separated by steep, sharp ridges. The coastline consists mostly of precipitous cliffs up to 1400 ft. high except where broken by coves and bays at the canyon mouths. The coves mostly have cobble-stone beaches although a few of the larger ones have sandy beaches. On the Channel slope the canyons are broader and less steep. On the Pacific slope, the windward side of

the island, the canyons are mostly narrower and longer and some of them much steeper. Around the island is a submerged shelf, about two miles wide on the Pacific side and a mile wide on the Channel side. Aside from the several man-made reservoirs on the island there is one small, shallow, intermittent pond, Echo Lake, at 1300 ft. about a mile NNE of Black Jack Mt., presumably there due to faulting and lack of a drainage outlet. A few of the canyons have permanent springs and small streams of running water.

GEOLOGY

The geology of the island is, according to Smith (1897, 1933), relatively simple. Underlying the NW two-thirds of the island and exposed over about half the island's area are metamorphic rocks thought to belong to the Franciscan series of Jurassic age. They consist mainly of various shists, serpentine, and garnet amphibolite. Exposed over an area of about 20 square miles on the SE third of Catalina are massive quartz hornblende diorite porphyry, which was intruded into the metamorphic rocks. Overlying parts of both the shists and the porphyry is a series of mostly andesitic lavas, partly or wholly of late Miocene age. The biggest area of these volcanic flows, about 13 square miles, covers the center and highest points of the island. Smaller, scattered areas total four square miles, and one of these SE of Isthmus Cove contains intercalated beds of tuff and diatomaceous earth up to 200 ft. thick. In addition there are recent alluviums in the valley bottoms, sands in some of the coves, and minor marine deposits on some of the marine terraces.

The geological history of Santa Catalina Island is of critical importance in understanding the origins and history of the present flora. Apparently it once formed part of a large land mass, Catalinia, that included the other Channel Islands and occupied a major portion of the present continental shelf off southern California, perhaps as early as Cretaceous time (Reed, 1933). This ancient land mass suffered intermittent periods of uplift and submergence, but unloaded great quantities of sediments into the seaway to the east during lower or middle Miocene time. It may have had occasional connections to the mainland. However, the history of the flora of the present island may be much more recent, for there is strong evidence to support submergence of most or all of the island during the Pleistocene, with intermittent re-emergence above sea level in the last half million years (A. O. Woodford, pers. comm.). The evidence for this uplift, presented by Smith (1933), consists primarily of marine terraces and their deposits on ocean-facing ridges and spurs with concordance of the bench levels on the various ridges up to about 1700 ft. elevation. In addition the accordance of the rounded summit elevations and the nearly horizontal crest line of the main ridge and some branch ridges at about 1550 ft. indicate prolonged marine abrasion during Pleistocene time, as on San Pedro Hill and Santa Rosa and San Clemente Islands. Water-worn pebbles along the main ridge and the elevation of the Little Harbor embayment are further evidence. The

Fig. 1. Grove of Catalina Ironwood, *Lyonothamnus floribundus floribundus*, on steep slope in Toyon (Banning's) Canyon. Kodachrome supplied by Doug Propst.

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uplift must have been not less than 1700 ft. in extent and may have been as much as 2100 ft.

This impressive evidence for the submergence of most or all of Santa Catalina during the Pleistocene, combined with the great depth of the San Pedro Channel separating the island from the mainland, forces the conclusion that the present flora of Santa Catalina Island has largely or wholly reached the island over water during the last half million years. The impossibility of migration overland perhaps accounts for the absence on Santa Catalina of native pines and some of the other large-seeded or northern elements found on the northern group of Channel Islands. The discovery of fossil remains of dwarf mammoths in Pleistocene terrace deposits on Santa Cruz, Santa Rosa, San Miguel, and San Nicolas (Savage and Downs, 1954) would seem to require terrestrial connections of those islands with each other and with the mainland during the Pleistocene. Those islands probably represent a greatly extended Santa Monica mountain area that was later dissected by increase in sea level with attendant erosion.

If the present biota of Santa Catalina Island has been derived almost entirely over water from mainland source areas during the last few hundred thousands, if not tens of thousands, of years, we must assume that the many distinctive insular endemics (at least 28) on Santa Catalina were present on the mainland until relatively recently. This is substantiated in part by the considerable fossil record of the Tertiary equivalents of *Lyonothamnus floribundus*, *Quercus tomentella*, *Prunus ilicifolia lyonii*, *Ceanothus arboreus*, and *Rhamnus pirifolia*, among others, on the mainland. Possibly increasing aridity of the mainland climate accounted for the disappearance from the mainland of these presently insular endemics, and may have had some bearing upon the recent extinction of the large mammals (mammoth, mastodons, horses, camels, bison, dire wolf, short-faced bears, giant ground sloths, sabre-toothed cats, etc.) of Rancholabrean time. It is obvious that Santa Catalina and the other California Islands have served as a last refuge for most of the flowering plants now restricted to them.

CLIMATE AND SOILS

The climate of Santa Catalina Island is oceanic and Mediterranean, with warm, dry summers and mild, moist winters with much fog. Dunkle (1950) called the climate arid maritime. The only effective rainfall comes in the winter months starting usually late in September or early October with the peak in February and diminishing again through late April. Taken over a 32-year period (Dunkle, 1950), the total annual precipitation at Avalon averaged 12.35 in. In 1965 the Santa Catalina Airport measured an unusually heavy rainfall for the months of April, November, and December resulting in a total for the year of 19.63 in., 5.27 in. greater than normal (U. S. Dept. Commerce, 1966). However, in 1966 the same station measured a total for the year of only 10.02 in., 4.34 in. less than normal (U. S. Dept. Commerce, 1967).

Over a 28-year period (U. S. Dept. Agriculture, 1941), with no killing frosts recorded, the growing season at Avalon was 365 days each year. For Avalon the January average temperature is 54.8° F and July average 66.6°. According to Dunkle (1950) the mean annual temperature for Santa Catalina is 60.9° with

mean annual range 11.3° . In 1965 at the Santa Catalina Airport the highest temperature recorded was 98° on Oct. 22, and the lowest 39° on Jan. 1 (U.S. Dept. Commerce, 1966). In 1966 at the same station the highest temperature recorded was 94° on Aug. 26, and the lowest 40° on Mar. 2 (U.S. Dept. Commerce, 1967).

The prevailing winds blow from WNW; however, dry, warm Santa Ana winds from the mainland during the winter months are often violent and sustained. Since the NE side of Santa Catalina is obviously moister than the SW side, it is possible that the main storm tracks from the North are deflected down along the E side of the island, as Raven (1963) has suggested for San Clemente Island. Also, and perhaps more important, the NE slopes toward the

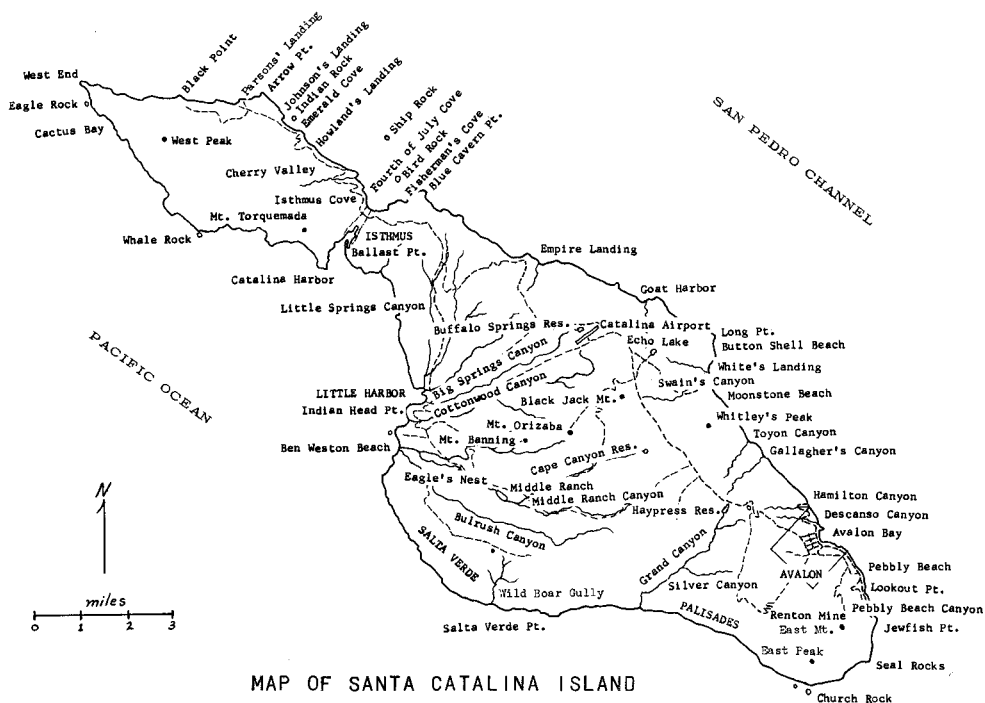


Fig. 2. Map of Santa Catalina Island showing principal streams, roads, and collection stations.

Channel are protected from the drying effects of the prevailing western winds and of the hot afternoon sun.

The soils of Santa Catalina Island are included by the U.S. Department of Agriculture (1938) in the Altamont-Los Osos-Cayucos Areas as atypical prairie soils, developed under a warmer climate and lighter in color than typical prairie

soils. The soils "are dominantly of loam to clay texture, often of adobe structure, and neutral to slightly acid in reaction." The soils on the ridges and canyon slopes are mostly shallow and heavy, clay loams or rocky-clay loams, with frequent outcroppings of the underlying bedrock. The silty clays around the reservoirs are especially heavy. Only the deep, loamy soils of the valleys and canyon mouths are especially suitable for forest growth.

VEGETATION

The prevalent plant communities of Santa Catalina Island are surfweed, coastal grassland, coastal sage scrub, maritime desert scrub, chaparral, oak and riparian woodlands, and ruderal communities. Less well developed are the marine meadow, coastal salt flat succulent, coastal dune grassland, and freshwater marsh and aquatic communities. They are discussed here in order of decreasing size of dominants and from the interior of the island to the coast.

Woodlands are best developed in the relatively moist, protected canyons and valleys on deep, rich alluvial soil, as well illustrated by the dense but low forest of *Prunus ilicifolia lyonii* in Cherry Valley. Groves of *Quercus tomentella* and *Lyonothamnus floribundus floribundus* (Fig. 1, 9, 12) are rather widely scattered on the north- and east-facing slopes of various canyons and the higher mountains, with the island oak forming an almost continuous forest of large trees to 60 and 70 ft. tall and 2 ft. DBH along one of the main forks of Gallagher's Canyon. Both species commonly attain heights of 50 ft. on the island. On the S and W slopes of Mt. Orizaba is an open woodland of groves of *Quercus chrysolepis* and *Q. tomentella* and their intermediates along with scattered trees of *Quercus dumosa*, *Comarostaphylis diversifolia*, *Heteromeles arbutifolia*, *Prunus ilicifolia lyonii*, *Sambucus mexicana*, and various shrubs (Fig. 14).

In the shaded canyons various woodland herbs, most of them vernal annuals, are abundant, such as *Bowlesia incana*, *Torilis nodosa*, *Sonchus* spp., *Thelypodium lasiophyllum*, *Thysanocarpus laciniatus*, *Triodanis biflora*, *Cerastium glomeratum*, *Stellaria media*, *Chenopodium californicum*, *Eucrypta chrysanthemifolia*, *Pholistoma auritum*, *P. racemosum*, *Pterostegia drymarioides*, *Claytonia perfoliata*, *Ranunculus hebecarpus*, *Galium aparine*, *Hesperocnide tenella*, and *Parietaria floridana*. Many of these are introduced plants. *Dentaria californica*, though found only in Cherry Valley, is a native perennial especially characteristic of this habitat. Several ferns are common here, as *Dryopteris arguta*, *Polypodium californicum*, *Adiantum jordanii*, *Pityrogramma triangularis*, and *P. viscosa*. The rare *Adiantum capillus-veneris* is found in a few deep canyons on constantly wet rocks.

Along the few permanent streams in various canyons, and best developed in Middle Ranch and Cottonwood Canyons, is a riparian woodland formed by *Populus trichocarpa*, the largest tree on the island, *P. fremontii*, *Salix laevigata*, *S. lasiolepis*, *Sambucus mexicana*, and occasional specimens of *Quercus x macdonaldii*, the tree with the broadest crown on the island. *Platanus racemosa*, possibly introduced, is found only in Cottonwood Canyon. Several species of shrubs and vines often form tangled thickets along the streams, as *Rosa californica*, *Rubus ursinus*, *Symphoricarpos mollis*, *Toxicodendron radicans diversiloba*,



Fig. 3. Fisherman's Cove, site of the projected Marine Biological Station at the Isthmus.
Fig. 4. Aerial view of Channel slope of Santa Catalina Island with Mt. Orizaba (left background) and Black Jack Mt. (peak in right background) visible above the beaches and coves at mouths of Gallagher's Canyon (left) and Toyon Canyon (right).

Lonicera hispidula vacillans, *Marah macrocarpa*, *Clematis ligusticifolia*, *Penstemon cordifolius*, and *Vitis girdiana*. The large herbs *Ambrosia psilostachya*, *Artemisia douglasiana*, *Baccharis* spp., *Xanthium* spp., *Urtica dioica holosericea*, *Verbena robusta*, and *Elymus* spp. also belong to the riparian community.

The chaparral community on Santa Catalina is restricted principally to the north- and east-facing slopes draining toward the Channel or in protected canyons and arroyos of the Pacific slope. It is best developed in the Hay Press area of the summit ridge, on the slopes of Black Jack Mt., and in various of the larger canyons like upper Avalon, Bulrush, and Middle Ranch Canyons. The most noteworthy species of this community are *Quercus dumosa*, the most abundant shrub or small tree, *Rhus integrifolia*, *R. laurina*, *R. ovata*, *Toxicodendron radicans diversiloba*, *Crossosoma californicum*, *Arctostaphylos subcordata*, *Xylococcus bicolor*, *Eriodictyon traskiae*, *Lepechinia fragrans*, *Dendromecon rigida rhamnoides*, *Ceanothus arboreus*, *C. megacarpus insularis*, *Rhamnus pirifolia*, *Adenostoma fasciculatum*, *Cercocarpus betuloides blanchaeae*, *C. traskiae*, *Heteromeles arbutifolia*, *Mimulus puniceus*, *Solanum wallacei*, and such herbs as *Gnaphalium* spp., *Perezia microcephala*, *Orobanche bulbosa*, and *Scrophularia villosa*. In some places long protection from fire and pruning of side branches by goats have made the chaparral shrubs arborescent and the community more of an open sclerophyll woodland with the appearance of a grassy savanna woodland.

Coastal sage scrub is a more open community of lower shrubs, covering many canyon slopes and sea bluffs where the soil is shallow and rocky (Fig. 23). This community has several aspects depending upon exposure to sun, wind, and salty spray. In its best development on more protected slopes the most conspicuous shrubs are *Rhus integrifolia*, *R. laurina*, *Artemisia californica*, *Brickellia californica*, *Encelia californica*, *Eriophyllum confertiflorum*, *Senecio lyonii*, *Opuntia littoralis et al*, *Cleome isomeris*, *Symphoricarpos mollis*, *Lotus argophyllus ornithopus*, *L. scoparius*, *Lupinus albifrons*, *Salvia apiana*, *S. mellifera*, *Malacothamnus fasciculatus catalinensis*, *Eriogonum giganteum giganteum* (Fig. 22), *Galium angustifolium*, *G. nuttallii*, *Castilleja foliolosa*, and *Solanum wallacei*. The following herbs are also components of the coastal sage scrub: *Achillea millefolium s. l.*, *Cirsium* spp., *Haplopappus squarrosus grindelioides*, *Rafinesquia californica*, *Calystegia macrostegia*, *Marah macrocarpa*, *Mentzelia micrantha*, *Zauschneria* spp., *Antirrhinum nuttallianum*, *Scrophularia villosa*, *Solanum douglasii*, *Calochortus splendens*, *Andropogon barbinodis*, *Bromus pseudolaevis*, *Melica imperfecta*, and *Poa scabrella*.

On the steep sea bluffs, particularly where exposed to coastal fogs and protected from the agile goats, several of the most exciting island plants occur. Along with many of the species just listed are: *Polypodium californicum*, *Coreopsis gigantea*, *Eriophyllum nevinii*, *Hemizonia clementina*, *Malacothrix saxatilis*, *Dudleya hassei*, *D. virens*, *D. greenei*, *Crossosoma californicum* (Fig. 20), *Phacelia lyonii*, *Gilia nevinii*, *Eriogonum latifolium grande*, *Calandrinia maritima*, *Galium catalinense*, *Galvesia speciosa* (Fig. 19), and *Mimulus puniceus*. On the steep bluffs about Avalon Bay and adjacent areas a number of garden escapes have become established. The more colorful of these additions to the local flora are *Centaurea cineraria*, *Cytisus linifolius*, *C. monspessulanus*, *Lathyrus tingitanus*, *Pelargonium xhortorum*, *Limonium perezii*, *Tropaeolum majus*, and



Fig. 5. Looking N from Indian Head Point across Little Harbor (left) and Shark Harbor (right) up Little Springs Canyon and the road to the Isthmus.

Fig. 6. East Peak, 1684 ft, and precipitous southeastern point of Santa Catalina Island.

Centranthus ruber. The guano-enriched but shallow soil on top of Bird Rock off Fisherman's Cove supports a dense but low community of *Coreopsis gigantea*, *Lavatera assurgentiflora*, and *Opuntia* spp. (Fig. 15 & 16) and perhaps indicates the type of plant cover that may have been general over the coastal areas of Santa Catalina before the advent of goats.

Perhaps best treated with the coastal sage scrub though really forming a crevice plant community of their own are the plants inhabiting barren, sunny, rocky slopes or crevices in rock walls, usually with south or west exposures. Among the most characteristic species of this habitat are *Selaginella bigelovii*, *Cheilanthes californica*, *Pellaea andromedaefolia*, *P. mucronata*, *Apiastrum angustifolium*, *Caucalis microcarpa*, *Silene antirrhina*, *S. gallica*, *Lupinus hirsutissimus*, *L. truncatus*, *Emmenanthe penduliflora*, *Phacelia cicutaria hispida*, *Salvia columbariae*, *Eschscholzia ramosa*, *Allophyllum glutinosum*, *Gilia angelensis*, *G. nevinii*, *Oligomeris linifolia*, *Antirrhinum nuttallianum*, *Aristida adscensionis*, *Festuca megalura*, *F. pacifica*, and *Muhlenbergia microsperma*.

On the headlands and sea bluffs, exposed to the prevailing western winds from the Pacific, near the western bulge of the island there is a limited area covered by an especially arid coastal community. It is Dunkle's maritime desert shrub (1950) and is much more characteristic of San Clemente Island and the Californian coast from San Diego County south to Cabo San Quintin. This maritime desert scrub is particularly well developed on the SW side of Indian Head Point (Fig. 17 & 18). The conspicuous plants are *Opuntia prolifera*, *Opuntia littoralis* et al, *Bergerocactus emoryi*, *Lycium californicum*, *Encelia californica*, *Artemisia californica*, *Rhus integrifolia*, *Frankenia grandifolia* along with such herbs, many rather succulent, as *Amblyopappus pusillus*, *Haplopappus venetus furfuraceus*, *Perityle emoryi*, *Atriplex californica*, *A. coulteri*, *A. semibaccata*, *Dudleya hassei*, *Mesembryanthemum crystallinum*, *M. nodiflorum*, *Mirabilis laevis*, and *Dichelostemma pulchellum*.

Where shallow soils cover the rocky, exposed ridges and slopes and openings in the chaparral and oak woodland, there is usually at least a sparse grassland community, dominated by such introduced grasses and weeds as *Avena barbata*, *A. fatua*, *Bromus rubens*, *B. mollis*, *B. diandrus*, *Hordeum glaucum*, *Erodium cicutarium*, and *Medicago polymorpha*. Before the island became overstocked with goats and other grazing animals, such native perennial grasses as *Stipa pulchra*, *S. cernua*, and *S. lepida* probably were the principal components of this grassland. The native grasses seem to come back rather rapidly where the goats are eliminated. In the winter and spring months the moister grasslands, especially on the Channel slope, are often colorful with the flowers of many annual and perennial herbs. Some of the more common are *Sanicula arguta*, *Lasthenia chrysostoma*, *Layia platyglossa campestris*, *Microseris* spp., *Amsinckia* spp., *Cryptantha* spp., *Silene gallica*, *Astragalus leucopsis*, *Lotus* spp., *Lupinus* spp., *Trifolium* spp., *Clarkia* spp., *Eschscholzia* spp., *Gilia* spp., *Linanthus dianthiflorus*, *Calandrinia ciliata menziesii*, *Dodecatheon clevelandii insulare*, *Delphinium parryi*, *Castilleja affinis*, *Orthocarpus purpurascens*, *Viola pedunculata*, *Sisyrinchium bellum*, *Allium peninsulare*, *Bloomeria crocea*, *Calochortus catalinae*, and *Dichelostemma pulchella*. Prickly-pear clumps are everywhere and serve as a spiny haven for the bulbiferous lilies and as a seed-bed for various woody plants. By summer the grasslands are dry and rather barren with the



Fig. 7. West End of Santa Catalina Island with Cactus Bay and Eagle Rock on the left. Note scattered chaparral on the slopes.

Fig. 8. A shrub of Tree Poppy, *Dendromecon rigida rhamnoides*, on bare W slope of Black Jack Mt. The large flowers are bright yellow and the shrubs always seem to be in bloom.

only color produced by the very abundant *Hemizonia fasciculata* and such less common late bloomers as *Corethrogyne filaginifolia*, *Stephanomeria virgata*, and *Trichostema lanceolatum*.

On the very rocky ridges and slopes where there is hardly any soil and on the heavily eroded clayey slopes with sparse or no grassy cover a number of mostly annual herbs form an open, depauperate, largely vernal community. Among the species characteristic of this arid, exposed habitat are *Filago* spp., *Hemizonia fasciculata*, *Madia* spp., *Psilocarphus tenellus*, *Stylocline gnaphalioides*, *Cryptantha* spp., *Harpagonella palmeri*, *Pectocarya linearis ferocula*, *Descurainia pinnata*, *Lepidium* spp., *Dichondra occidentalis*, *Crassula erecta*, *Eremocarpus setigerus*, *Astragalus gambelianus*, *A. didymocarpus*, *Lotus* spp., *Lupinus* spp., *Trifolium* spp., *Centaurium venustum*, *Plantago* spp., *Navarettia* spp., *Alchemilla occidentalis*, *Linaria canadensis texana*, *Brodiaea jolonensis*, *Chlorogalum pomeridianum*, *Agrostis diegoensis*, and *Festuca* spp.

Freshwater marsh and aquatic communities are restricted on Santa Catalina Island by the scarcity of surface water except in the small permanent streams in Middle Ranch, Cottonwood, and Bulrush Canyons and in the man-made reservoirs. Submersed plants, where found, are usually either *Potamogeton pectinatus* or *Ruppia maritima*. *Potamogeton crispus*, *P. foliosus* (?), *Polygonum coccineum*, and *Elatine californica* have each been collected once. *Azolla filiculoides* was the only free-floating aquatic found. Emerged palustrine plants are more numerous and include *Equisetum laevigatum*, *E. telmateia braunii*, *Asclepias fascicularis*, *Cotula coronopifolia*, *Pluchea purpurascens*, *Rorippa nasturtium-aquaticum*, *Mentha* spp., *Rumex* spp., *Anemopsis californica*, *Mimulus* spp., *Carex tumulicola*, *Eleocharis palustris*, *Scirpus microcarpus*, *Juncus* spp., *Polypogon* spp., *Typha domingensis*, and *T. latifolia*. On the desiccated margins of ponds and reservoirs is another small but distinctive community of plants including *Gnaphalium palustre*, *Ammania coccinea*, *Verbena bracteata*, *Juncus bufonius*, *Crypsis schoenoides*, and *Hordeum californicum*.

The maritime communities are somewhat limited around Santa Catalina, though there is probably much more surfweed, *Phyllospadix scouleri* and *P. torreyi*, than the collections would indicate. At least one patch of *Zostera marina* is known from about 20 ft. of water in Catalina Harbor. The coastal salt flat succulent community is restricted largely to the salinas at Shark, Little, and Catalina Harbors. The small salina within and at the base of Ballast Point in Catalina Harbor has the richest flora with *Amblylopappus pusillus*, *Jaumea carnosa*, *Atriplex leucophylla*, *A. semibaccata*, *A. watsonii*, *Salicornia subterminalis*, *S. virginica*, *Suaeda californica*, *Spergularia macrotheca*, *Frankenia grandifolia*, *Distichlis spicata stolonifera*, *Monanthochloe littoralis* and *Parapholis incurva*. Nearby on muddy saline shores and flats around Catalina Harbor are also *Spergularia marina*, *Beta vulgaris maritima*, and *Plantago coronopus*.

Coastal dune grassland is severely limited due to the relatively few sandy beaches with very small dune areas that are heavily trampled by human traffic. The best dune areas are at Little and Shark Harbors and Ben Weston Beach, with their dune flora consisting mostly of *Mesembryanthemum crystallinum*, *M. nodiflorum*, *Ambrosia chamissonis*, *Haplopappus venetus furfuraceus*, *Heliotropium curassavicum*, *Cakile maritima*, *Atriplex leucophylla*, *A. semibaccata*,

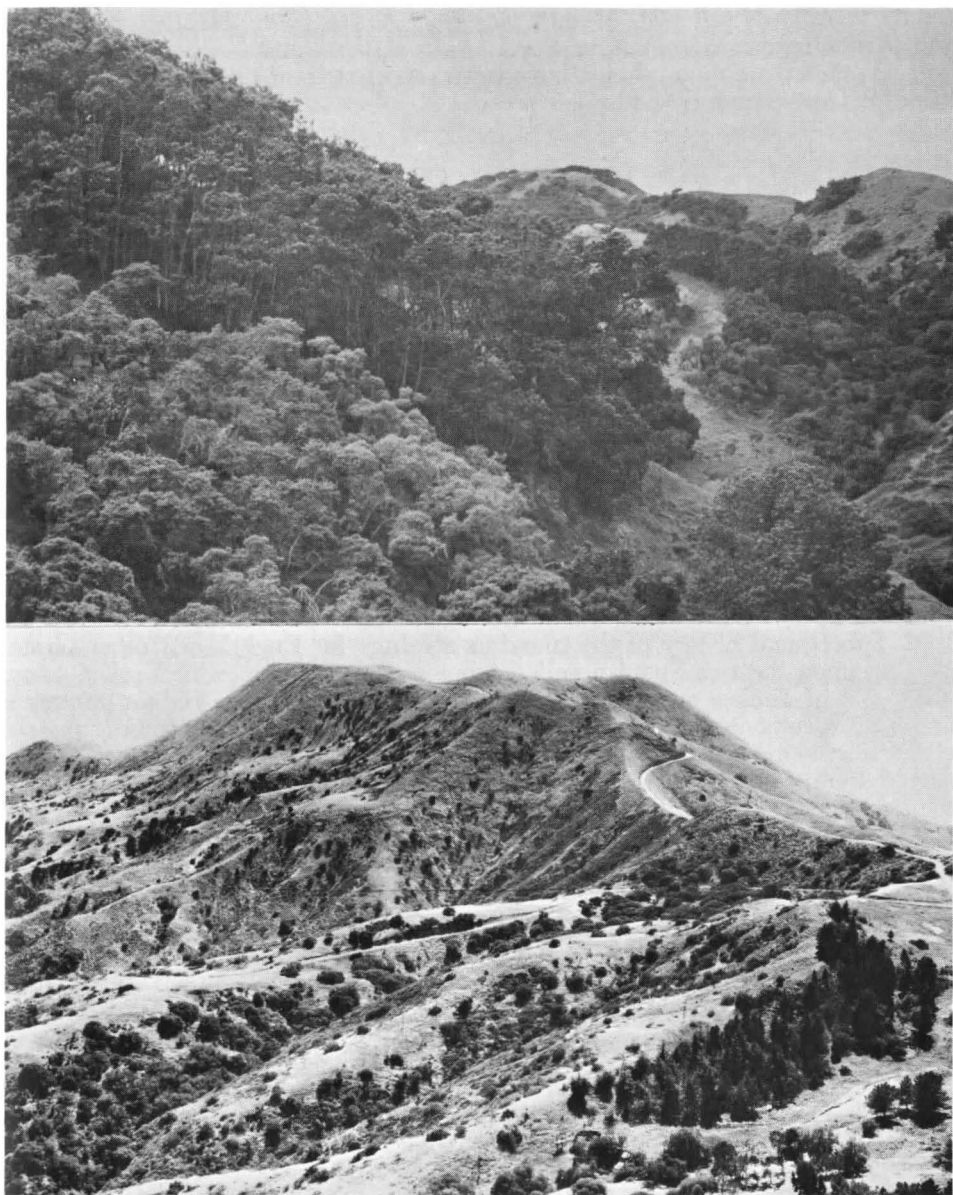


Fig. 9. Two groves of Catalina Ironwood (upper left and right rear) on steep slopes in Toyon (Banning's) Canyon. Kodachrome supplied by Doug Propst.

Fig. 10. Mt. Orizaba, 2069 ft, as viewed from Black Jack Mt. to the north. The sparse cover of trees and shrubs is characteristic of the central ridge of the island. The conifer grove on the right is planted.

Cressa truxillensis vallicola, *Abronia maritima*, *A. umbellata*, *Plantago coronopus*, and *Distichlis spicata stolonifera*. *Carpobrotus chilensis* and *Calystegia soldanella*, both characteristic dune plants, have been reported from the island many years back but are apparently no longer present.

HISTORICAL CHANGES

The recent history of the island has much relevance to an understanding of the present flora. The first explorers noted a thriving and friendly Indian population calling themselves Pimugnans and manifesting a maritime Chumash culture based upon fishing, boat-building, manufacture of soapstone ollas and other objects from steatite quarries, and trade in those objects with Indians on the other islands and the mainland. One Indian site, a shell midden on Indian Head Point near Little Harbor, has a radiocarbon date of nearly 4000 years before the present (Meighan, 1959). Since acorns were a staple food among the Chumash Indians, it is conceivable that some of the oak species, and perhaps certain other "indigenous" plants, were brought to the island by early Indian inhabitants.

A Portuguese navigator, Juan Cabrillo, in the services of Spain, was the first European explorer to visit Santa Catalina Island (Pimu) and the Pimugnans on Oct. 7, 1542. Next to visit the island was Juan Rodriguez Ceremenho returning from the Philippines in 1593. General Sebastian Viscaino, out of Acapulco with three ships, visited the island and again claimed it for Spain on Nov. 24, 1602. Subsequent history of the island as a refuge for English and other pirates preying upon the rich Spanish galleons out of the Philippines, of Yankee smugglers, and of Yankee and Russian fur traders with their Aleut Indian hunters is less well documented. The Aleuts are said to have slaughtered not only the sea otters but many of the island Indians. The remainder of the Indians were removed from the island between 1820 and 1832 to the mainland missions, where they promptly died of disease (Overholt, 1962).

Before Governor Don Pio Pico fled to Mexico during the American conquest of California in 1846, he granted Santa Catalina Island to his Yankee friend Tomas Robbins of Santa Barbara. Since then the ownership of the island has passed through many hands until William Wrigley Jr. of Chicago acquired a majority interest in the Santa Catalina Island Company in 1919. The first white man to reside on the island was Samuel Prentiss, who lived above Emerald Bay from 1824 until his death in 1854. Many other squatters settled on the island to raise sheep, cattle, and horses. During the Civil War a mining boom in the Isthmus area and fear of Confederate spies and raiders caused barracks to be built and occupied in 1863-64 by government troops. The mining boom collapsed, and few now remember that gold in California was first discovered on Santa Catalina. A mine on Mineral Hill produced mostly silver and lead and some gold (Overholt, 1962). In the 1920's lead, zinc, and silver were mined on Black Jack Mt. and processed in a flotation mill at White's Landing. Also the Renton Mine in the upper end of Pebbly Beach Canyon was then developed. The island is rich

Fig. 12. Small grove of Catalina Ironwood, *Lyonothamnus floribundus floribundus*, on E flank of Black Jack Mt. looking up from Summit Road at 1400 ft.



Fig. 11. Looking E down Swain's Canyon to White's Landing from the Summit Road on the E flank of Black Jack Mt., a drop of 1400 ft. Most of the trees in the foreground are Catalina Cherry, *Prunus ilicifolia lyonii*, and scrub Oak, *Quercus dumosa*.

in minerals but they are difficult and expensive to extract. Before World War II, clay and talc were mined on the island for a local Catalina ceramics industry. Today the mining activities are rather extensive quarrying operations producing rock for fill and harbor improvements (Doran, 1963). Avalon was laid out as a townsite in 1887 and was incorporated in 1913. In 1929 William Wrigley Jr.'s famous Casino was formally dedicated. Further information on the island's history can be found in "The Catalina Story" by Alma Overholt (1962) and "The Ranch that was Robbin's. Santa Catalina Island" by Adelaide Doran (1963).

Perhaps the most significant historical event for the island's flora was the disastrous introduction of goats to Santa Catalina, at least as early as 1827 (Dunkle, 1950). Since that time many thousands of these pernicious mammals have ranged freely over the island devastating the vegetation by over-grazing, destroying the soil through removal of the plant cover (Fig. 26), turning much of the island into gullied badlands (Fig. 24), and undoubtedly eliminating many species from the island, including rare insular endemics. Fortunately, in the last twelve years the Santa Catalina Island Company has made a concerted effort to bring all grazing under control. Improvement in the vegetation is apparent, especially in the central part of the island. The great flocks of sheep that once roamed the island doing great damage have been entirely removed. Cutting of timber for firewood, which in early years must have been a large factor in deforesting the island, has long been prohibited. Lately, feral pigs have become a serious problem, churning up the soil and rooting out the vegetation over extensive areas in some of the canyons examined. The introduced California mule deer and bison seem much at home on the island and probably do comparatively little damage. Hopefully the feral goats and pigs will be brought under stringent control if not entirely eliminated from the island. Among the few native terrestrial mammals, the following are restricted to Santa Catalina Island: the small island gray fox (*Urocyon litoralis catalinae*), the island ground squirrel (*Citellus beecheyi nesioticus*), western harvest mouse (*Reithrodontomys megalotis catalinae*), and deer mouse (*Peromyscus maniculatus catalinae*) (McLaughlin, 1959).

BOTANICAL EXPLORATION

Millspaugh and Nuttall (1923) have given a thorough list of the botanists, with their bibliographies, who collected on Santa Catalina Island through 1922. There is no need to repeat that information here beyond mentioning that the principal collectors of vascular plants on the island through 1922 were W. Gambel (1847), W. S. Lyon and J. C. Nevin (1884, 1885), T. S. and K. C. Brandegee (1884, 1889, 1890, 1899, 1916), A. and A. M. Davidson (1892, 1893, 1894, 1895), A. T. McClatchie (1893), Mrs. Blanche Trask (1895-1907), G. B. Grant (1900, 1901, 1903, 1904), W. L. Jepson (1908), R. L. Pendleton and F. M. Reed (1909), H. H. Smith (1912), Alice Eastwood (1917), C. F. Millspaugh (1919, 1920), L. W. Nuttall (1920-1921), and F. C. Knopf (1921-22). Most of the collections of these botanists were examined by Millspaugh for his flora, and many of them have also been studied by me in the preparation of this flora. I have placed, however, principal emphasis on my own collections and the many others made



Fig. 13. Looking N across top of Ironwood grove in Swain's Canyon to hills near Echo Lake. Most of the low, spreading trees are Scrub Oak, *Quercus dumosa*.

Fig. 14. Oak woodland at 1600 ft with *Quercus dumosa*, *Q. tomentella*, *Heteromeles arbutifolia*, and *Comarostaphylis diversifolia planifolia* on N slope of Mt. Banning (1743 ft). Mt. Torquemada beyond Isthmus is in background to right.

subsequent to Millspaugh's survey, as well as on some of Blanche Trask's collections that were apparently not available to Millspaugh.

The principal collections made on Santa Catalina Island since 1922, at least so far as I could determine from specimens examined, were by the following botanists, listed chronologically: M. B. Dunkle, F. R. Fosberg, C. B. Wolf, R. V. Moran, E. R. Blakley, P. H. Raven, M. A. Piehl, and R. F. Thorne (with P. C. Everett, M. Z. Thorne, D. Propst, or others). Smaller collections have been made by M. E. Jones, I. L. Wiggins, J. Ewan, P. C. Everett, V. Grant, K. K. Muller, B. C. Templeton, D. Breedlove, D. L. Walkington, R. N. Philbrick, M. R. Benedict, D. Propst, and probably by many others visiting the island briefly, usually in the vicinity of Avalon, the Isthmus, or White's Landing. My own collections total 1227 numbers and perhaps 3700 sheets. The following list summarizes the information I have gleaned on the collecting dates, collection numbers, and total number of collections of the principal collectors of vascular plants on Santa Catalina Island during the last forty years.

COLLECTORS	COLLECTION DATES	COLLECTION NUMBERS	TOTAL NUMBER OF COLLECTIONS
1. M. B. Dunkle	Mar.-May 1928		perhaps 400
2. F. R. Fosberg	Mar. 18-May 22, 1931 July, Dec. 1931 May 1932	S4280-S4945	perhaps 800
3. C. B. Wolf	May 9-14, 1932 Oct. 3-6, 1932	3420-3635 4206-4249	260
4. R. V. Moran	Feb. 23-Mar. 14, 1941 Feb. 7-9, 1949	602-709 3150-3154	113
5. E. R. Blakley	Sept. 23-24, 1961 Jan. 7, 1962 Oct. 3-6, 1962 Apr. 7-10, 1963	4717-4786 4834-4839 5366-5480 5498-5607	300
6. P. H. Raven	May 20-23, 1962	17764-17859	96
7. M. A. Piehl	Oct. 3-6, 1962		about 75
8. R. F. Thorne with		33290-33309,	
P. C. Everett	Feb. 6-7, 1964	33425-33493	
" "	May 10-11, 1965	34425-34680	
" "	June 22-24, 1965	34844-35050	
M. Z. Thorne	Apr. 4-7, 1966	35747-35988	
S. Carlquist &			
M. Z. Thorne	Apr. 28-30, 1966	36187-36358	
M. Z. Thorne	May 31-June 2, 1966	36413-36531	
" "	Sept. 14-17, 1966	36623-36724	
R. Rollins, D. Propst, R. Carolin	Mar. 18-19, 1967	36728-36767	1,227

Since the Millspaugh-Nuttall survey, the main institutional efforts to survey the island botanically have been made by the Rancho Santa Ana Botanic Garden, Los Angeles County Museum of Natural History, and Santa Barbara Botanic Garden.

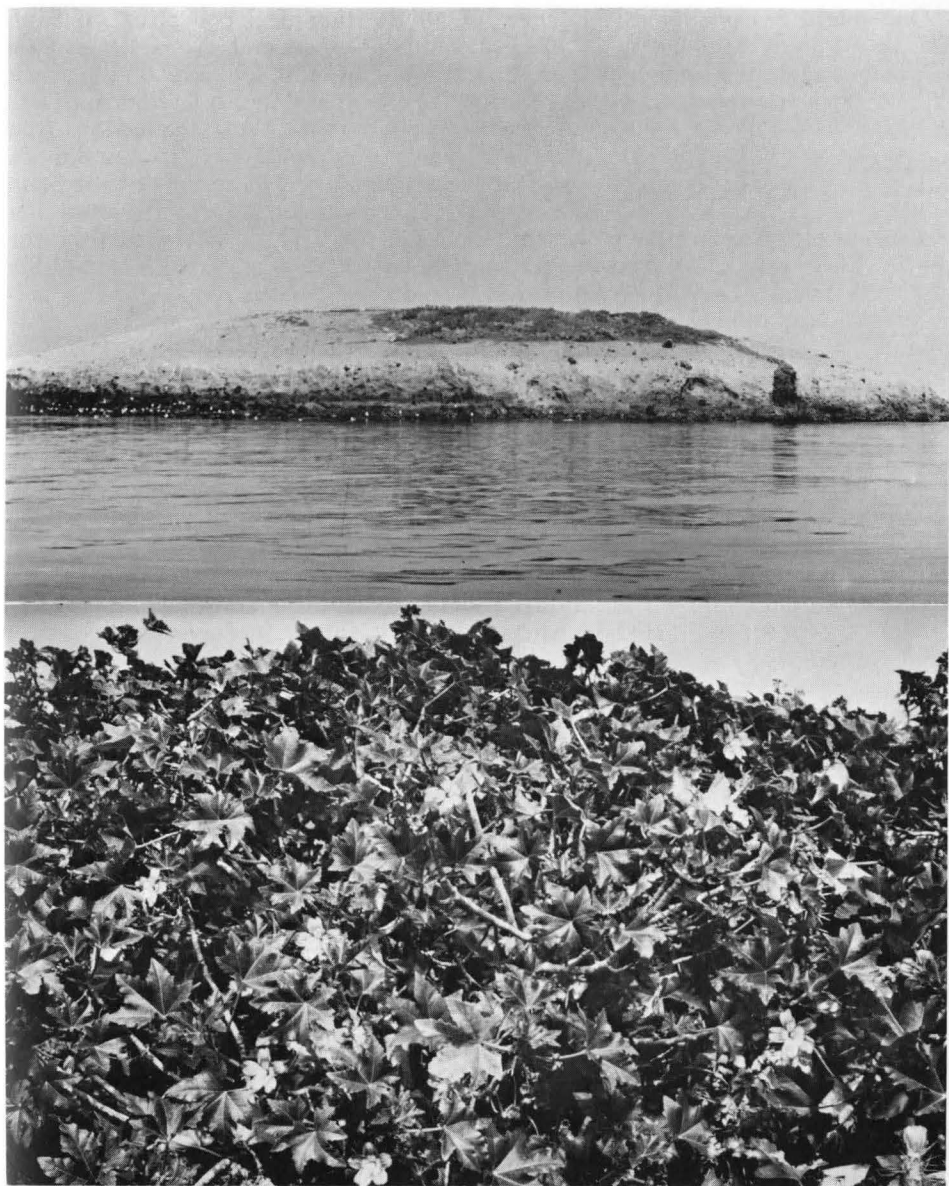


Fig. 15. Bird Rock off Fisherman's Cove and Isthmus Cove. Note gulls and patch of vegetation on top, consisting of dense, low thicket of *Lavatera assurgentiflora*, *Coreopsis gigantea*, and *Opuntia littoralis* x *O. oricola*.

Fig. 16. Dense, low shrubbery of *Malva-Rosa*, *Lavatera assurgentiflora*, an island endemic, on Bird Rock. The large flowers with spreading petals are rose with darker veins.

One might reasonably ask, in view of all the botanical collecting on Santa Catalina Island since Gambel's pioneer efforts in 1847 and of the large tome published by Millspaugh and Nuttall in 1923, how another flora of the island can be justified at this time. The Rancho Santa Ana Botanic Garden has long been interested in the island and its flora, starting with Wolf's collections from the island in 1932, and the POM-RSA Herbarium undoubtedly contains the largest accumulation of specimens from Santa Catalina. The officers of the Santa Catalina Island Company, realizing that important changes in the flora and vegetation of the island have occurred over the years, have encouraged the survey in every way. Thus, as a companion work to P. A. Raven's "A Flora of San Clemente Island, California" published in 1963, the present flora is being published to round out our knowledge of the Los Angeles County group of Channel Islands. It is hoped that the survey will be particularly helpful to staff and students at the Marine Science Center at the Isthmus and to the scientific staff of the Santa Barbara Botanic Garden in the furtherance of their floristic survey of all the Channel Islands.

The heavy collecting on the island since the Millspaugh-Nuttall survey, along with herbarium studies, has turned up 145 species unlisted for the island flora by Millspaugh and Nuttall. Fifty-nine of these species are regarded as indigenous and 86 as introduced, many of the latter certainly since the older survey. These new records include 6 additional indigenous and 3 additional introduced families and 20 additional indigenous and 39 additional introduced genera. Of 467 species listed by Millspaugh and Nuttall, 44 have been removed from the flora or combined with species already listed, 13 have been redetermined as other species, and 171 species have had their names changed to bring them in line with current usage. As a result, of the Millspaugh and Nuttall total of 467, only 239 specific names remain relatively unchanged. The current flora lists 559 species. A more depressing statistic is the number of species not collected in the last 25 years. Forty-eight indigenous and 18 introduced species seem to have disappeared from the island's flora. Some of these indeed have not been found on the island since their discovery by Blanche Trask (as *Mimulus traskiae*, *Sibara filifolia*, *Draba cuneifolia integrifolia*, *Tropidocarpum gracile*, *Sarcostemma cynanchoides hartwegii*) or even by W. Gambel in 1847 (*Dissanthelium californicum*).

RELATIONSHIPS OF THE FLORA

The 167 naturalized species on Santa Catalina Island can be largely disregarded here, for they have no bearing on the origins of the indigenous species. In discussing the 393 species that apparently reached the island, or in a few instances possibly evolved there, without the aid of man, I shall start with the endemic and less widely distributed species. Three species and two subspecies are apparently restricted to Santa Catalina Island:

Eriogonum giganteum
giganteum (Fig. 22)
Lyonothamnus floribundus
floribundus (Fig. 1, 9, 12)
Ceanothus traskiae

Mimulus traskiae (not seen since 1901)
Solanum wallacei

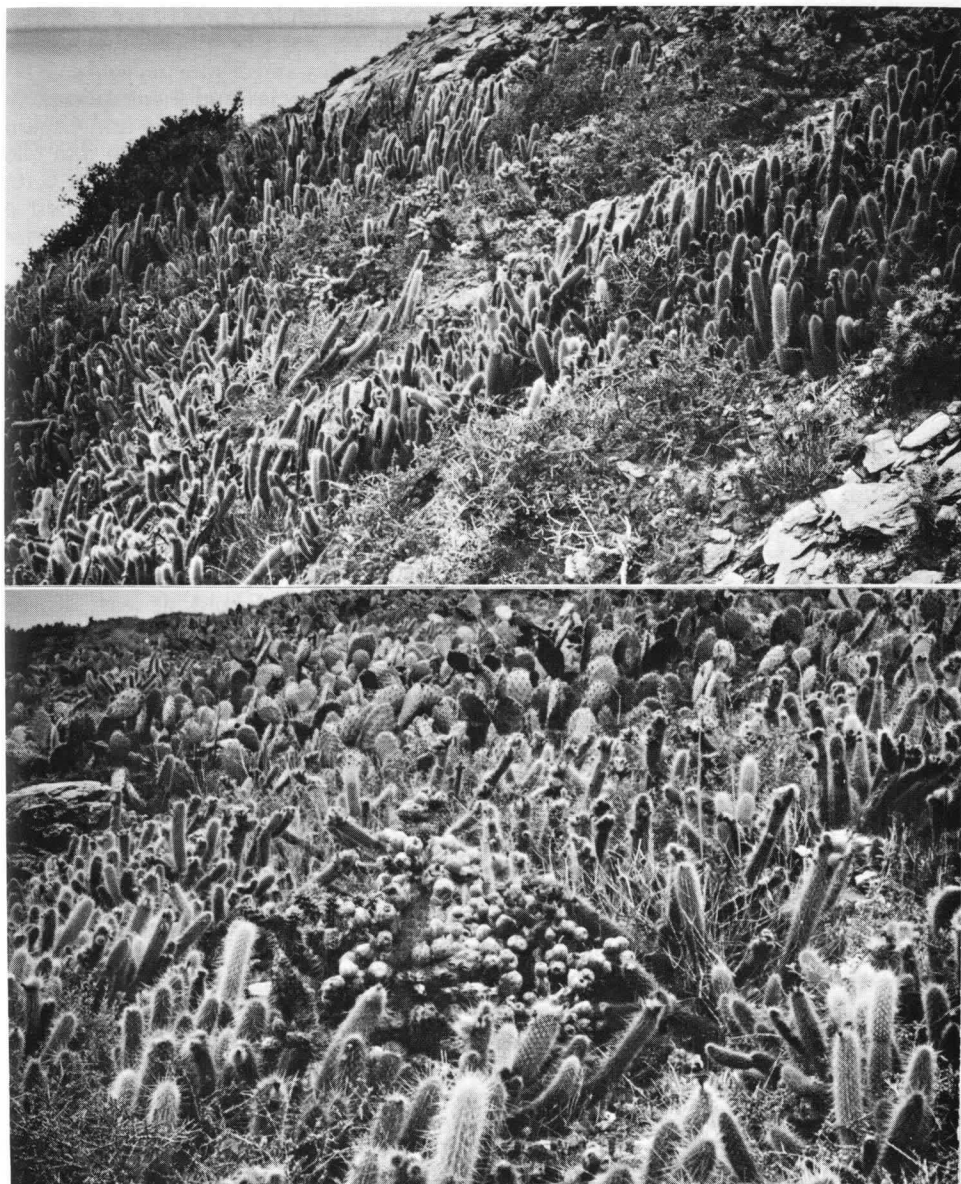


Fig. 17. Maritime desert scrub on SW tip of Indian Head Point with *Rhus integrifolia* (left), *Bergerocactus emoryi*, *Opuntia prolifera*, and *Lycium californicum* (right foreground).
Fig. 18. Closer view of maritime desert scrub on S slope of Indian Head Point, with *Opuntia littoralis* (background), *Bergerocactus emoryi*, *Opuntia prolifera*, and *Lycium californicum* (foreground).

As might be expected, the relationships among the insular species are strongest with San Clemente Island, 21 miles to the south. Of the 235 species that can be listed as native on San Clemente Island, only 33 species and 5 subspecies have not been collected yet on Santa Catalina. Seven of these species and 4 subspecies are endemic on San Clemente and 5 more are restricted to San Clemente and Guadalupe Islands. Thus only 21 species and 1 subspecies that are present on San Clemente and the northern islands or mainland are uncollected yet from Santa Catalina. On the other hand, of the 391 species native on Santa Catalina one-half of them, 195 species, are unreported from the more barren, less ecologically diverse, and somewhat smaller and more isolated island to the south. *Phacelia lyonii*, *Galium catalinense*, and *Lycium hassei* are known only from these two islands, and *Eriophyllum nevini* from these two plus Santa Barbara Island. Apparently restricted to Santa Catalina, San Clemente, and Guadalupe Islands are:

Crossosoma californicum (Fig. 20)
Cilia nevini
Galvezia speciosa (Fig. 19)

Scrophularia villosa
Dissanthelium californicum
 (possibly extinct)

Trifolium palmeri occurs on these three islands and on San Nicolas Island. Although unreported from San Clemente, *Dudleya hassei* is known from Santa Catalina and Guadalupe Islands.

Of the remaining 377 species native on Santa Catalina Island, at least 335 are also found on the Channel Islands to the north or west. The following insular endemics are restricted to Santa Catalina and the northern islands (the latter indicated by the abbreviations C for Santa Cruz, R for Santa Rosa, and M for San Miguel):

Sibara filifolia, C
Helianthemum greenii, C, M
Dudleya greenii, C, R, M

Arctostaphylos subcordata, C, R
Ceanothus arboreus, C, R

Somewhat more wide-ranging among the insular endemics are the following, restricted to Santa Catalina and at least some of both the northern and the southern islands (with the abbreviations as above, plus Cl for San Clemente, G for Guadalupe, B for Santa Barbara, A for Anacapa, N for San Nicolas, and BI for islands off Baja California):

Hemizonia clementina, Cl, B, A, N
Quercus tomentella, Cl, G, A, C, R
Lavatera assurgentiflora, Cl, A, C, R, M, N
Eschscholzia ramosa, Cl, G, B, A, C, R, BI

Ceanothus megacarpus insularis,
 Cl, A, C, M, R
Rhamnus pirifolia, Cl, C, M, R
Jepsonia malvifolia, Cl, G, C, R, N

In addition to these 28 species restricted to Santa Catalina alone or to Santa Catalina and the other California islands, there are 14 species or subspecies that are largely or strongly insular but represented in limited, mostly maritime, areas of the mainland. These are listed with their approximate ranges beyond Santa Catalina Island:

Chaetopappa lyonii—coastal Los Angeles Co. and Santa Monica Mts.

- Coreopsis gigantea*—G, B, A, C, R, M, N, coastal San Luis Obispo Co. to Los Angeles Co.
Senecio lyonii—Cl, Isla San Martín and Bahía de San Quintín of Baja California.
Aphanisma blitoides—Cl, G, B, M, coastal Los Angeles Co. to Baja California.
Dudleya virens—Cl, N, Pt. San Vicente of Los Angeles Co.
Euphorbia misera—Cl, G, coast of Orange Co. to Baja Calif., and Colorado Desert.
Eriodictyon traskiae—San Luis Obispo Co. to Ventura Co.
Pholistoma racemosum—Cl, G, B, C, N, coast from San Diego Co. to N Baja California.
Malacothamnus fasciculatus catalinensis—Santa Monica Mts.
Dendromecon rigida rhamnoides—Cl, Santa Monica Mts.
Eriogonum latifolium grande—Cl, A, C, R, M, Baja California.
Cercocarpus betuloides blanchaeae—C, R, Santa Monica Mts., Lompoc area of Santa Barbara Co.
Prunus ilicifolia lyonii—Cl, A, C, R, Sierra Giganta of Baja California.
Lycium californicum—Cl, G, B, M, N, and coastal Los Angeles Co. to Baja California.

The relationships of the flora of Santa Catalina Island with that of the nearby Santa Monica Mts. on the mainland are strong, as one might expect from proximity and somewhat similar habitats. Of the 363 species native on Santa Catalina but not restricted to the California islands only 63 are unreported yet from the Santa Monica Mts. and 5 others are represented there by a subspecies different from that on Santa Catalina. *Chaetopappa lyonii*, *Malacothamnus fasciculatus catalinensis*, and *Dendromecon rigida rhamnoides* largely or entirely are restricted to Santa Catalina and the Santa Monica Mts. *Cercocarpus betuloides blanchaeae* is shared by the Santa Monica Mts., Lompoc area, and by Santa Catalina, Santa Cruz, and Santa Rosa Islands. Including naturalized plants 451 of the 559 vascular plant species listed for Santa Catalina are reported from the Santa Monica Mts.

BIOLOGICAL SPECTRUM: LIFE-FORMS

It is instructive to compare the percentage distribution of life-forms, as originally proposed by Raunkiaer (1934), among the Santa Catalina plants with that of other floras having a somewhat similar Mediterranean climate. This is done in the following table for the native flora and the total flora of Santa Catalina Island as compared with the native flora of Santa Barbara Island, the total flora of the Canary Islands, the floras of several areas in the Mediterranean region, and Raunkiaer's "normal," or world flora, spectrum. The dominance of therophytes (annuals) and hemicryptophytes in floras developed in a Mediterranean climate is readily apparent. In the table the abbreviations represent the various life-forms as follows:

- P—Mesophanerophytes. Trees, 10–25 m high.
 M—Microphanerophytes. Shrubs or small trees, 2–10 m high.
 N—Nanophanerophytes. Small shrubs, 0.3–2 m high.
 Li—Climbing phanerophytes. Lianas with persistent stems.
 Ch—Chamaephytes. Vegetative buds not over 0.3 m above ground.
 H—Hemicryptophytes. Vegetative buds at surface of soil.
 G—Geophytes. Vegetative buds below surface of soil.
 Th—Therophytes. Annuals.
 E—Epiphytes, borne upon trunks or branches of woody plants.
 Pa—Parasites, depending on other plants for much or all of sustenance.
 SS—Stem-succulents.
 HH—Hydrophytes. Aquatic plants.

TABLE 1. *Life-forms of plants of Santa Catalina Island and other areas of Mediterranean climate.*

	No. OF SPECIES	PERCENTAGE DISTRIBUTION OF SPECIES AMONG LIFE-FORMS											
		P	M	N	Li	Ch	H	G	Th	E	Pa	SS	HH
Santa Catalina Island (native flora)	391	2	7	9	1	5	27	2	41	0	1	2	3
Santa Catalina Island (total flora)	557	1	6	8	1	3	27	2	48	0	1	1	2
Santa Barbara Island (native flora) (Dunkle, 1950)	57	0	0	5	-	21	7	10	45	0	-	7	2
Canary Islands (total flora) (Lems, 1960)	1531	-4-		15	1	16	17	5	36	0	-	1	1
Lowland of Madeira (Raunkiaer, 1934)	213	0	1	14	-	7	24	0	51	0	-	0	3
Ferrara, Italy (Raunkiaer, 1934)	657	-8-			-	3	39	15	35	-	-	-	-
Samos Island, Greece (Raunkiaer, 1934)	400	1	4	4	-	13	32	11	33	0	-	0	2
Cyrenaica, Libya (Raunkiaer, 1934)	375	1	1	7	-	14	19	8	50	0	-	0	0
Raunkiaer's Normal Spectrum (Raunkiaer, 1934)	400	6	17	20	-	9	27	3	13	3	-	1	1

ACKNOWLEDGMENTS

I am indebted to many people in the undertaking and publishing of this survey of the vascular plants of Santa Catalina Island. I offer sincere thanks to the officials of the Santa Catalina Island Company, particularly Philip K. Wrigley, President, and Douglas Propst, Ranch Superintendent. Mr. Wrigley's interest in the survey and generous contribution toward the flora's publication has made completion of the project possible. Mr. Propst has furnished enthusiastic encouragement, cooperation, transportation, and often guidance to critical areas and plants. Many others on the island, as Robert R. Given and Dennis Lees, Resident Biologists of the Marine Science Center, have been most helpful in many ways. Percy C. Everett, Superintendent of the Rancho Santa Ana Botanic Garden, and my wife, Mae Z. Thorne, have been most congenial and understanding field companions and have helped with the collection and preparation of specimens.

The directors and curators of the herbaria at the Santa Barbara Botanic Garden, Los Angeles County Museum of Natural History, Smithsonian Institution, Field Museum of Natural History, San Francisco Academy of Science, University of California at Berkeley, Stanford University, and Philadelphia Academy of Sciences have most generously allowed me to study their Santa Catalina Island specimens or have sent specimens for my examination. P. A. Munz, Verne Grant, Reed Rollins, Reid Moran, and Neil Muller have kindly checked some or all of my material respectively of the Onagraceae and *Orobanche*, Polemoniaceae, Brassicaceae, *Dudleya*, and *Quercus*, for which I am most grateful. Prof. A. O. Woodford of Pomona College has given freely of his time and knowledge of the geology of Santa Catalina Island and related areas. Peter Raven, Reid Moran, Ralph Philbrick, Dave Walkington, Doug Propst, Lyman Benson, and Bonnie C. Templeton have all generously supplied information, specimens, notes, directions, or kodachromes pertinent to the survey. James Henrickson, of the Rancho Santa Ana Botanic Garden, spent many hours transferring my kodachromes to black and white negatives and producing the excellent enlargements used in this paper. Finally, I also give many thanks to my wife and Mrs. Gloria Campbell Day for typing the final manuscript.

CATALOGUE OF THE VASCULAR PLANTS GENERAL REMARKS

In the following Annotated List I have included only those species for which I have seen specimens or, in a few instances, those gleaned from revisions and monographs or highly reliable observers. I have omitted without comment reported species based upon misidentifications or dubious or transposed records. Careful search in several herbaria failed to substantiate certain species listed for the island by Lyon (1886), Brandegee (1890a and b), Trask (1904), Eastwood (1941), and Dunkle (1950). I managed to collect, photograph (some prickly-pears), or observe (poison-oak) all but 73 of the listed species, and all but 9 of these have not been seen on the island in the last 25 years or longer.

In the Annotated List the families are arranged alphabetically within subdivisions, classes, or subclasses, as are also genera in families and species within genera. Asterisks indicate naturalized species. Synonyms are listed only if they were the names used in Millspaugh and Nuttall (1923) or differ from those used in Munz and Keck (1959), Raven (1963), or Raven and Thompson (1966). Common names are given, usually only after the first species in a genus, only if genuine or non-repetitive of the generic name. Frequency terms are based arbitrarily upon the following scale:

rare—1-3 collection or observation stations,
infrequent—4-7 stations,
frequent—8-12 stations,
common—more than 12 stations.

Habit of growth is given for each species, and probable area of origin for naturalized species. Habitat statements refer only to the species' habitats on

the island as obtained from field observations and collection labels. Elevations given are the extremes observed or gleaned from labels. For "rare" and some "infrequent" species collection data is listed by collector's name, number, and/or date. For specimens from herbaria other than POM-RSA the standard abbreviations of Lanjouw and Stafleu (Reg. Veg. 15: 1-249. 1959.) indicate the herbaria where the specimens are deposited. The first set of my collections is deposited in the Herbarium of the Rancho Santa Ana Botanic Garden, now combined into one series with the herbarium of Pomona College. The numerous Santa Catalina Island duplicates will be deposited mainly in herbaria concerned with the Channel Islands flora. Localities without collector's name or number are my sight records. For "frequent" and "common" species a few stations are listed, selected for their ease of access from Avalon or the Isthmus and to indicate distribution over the island. The map of Santa Catalina Island (Fig. 2) is intended to show all the collection stations cited in the Annotated List.

ANNOTATED LIST

SPHENOPSIDA

EQUISETACEAE

EQUISETUM LAEVIGATUM A. Br. [*E. kansanum* Schaffn.] Scouring-rush. Locally abundant only in shallow running water of stream bed in lower portion of Middle Ranch Canyon, 100-600 ft.

EQUISETUM TELMATEIA Ehrh. var. *BRAUNII* Milde. Giant Horsetail. Locally abundant only in shallow running water of stream bed in lower portion of Middle Ranch Canyon, 100-600 ft, with the preceding species.

LYCOPSIDA

SELAGINELLACEAE

SELAGINELLA BIGELOVII Underw. Spike-moss. Common over island on dry, rocky, open canyon slopes and ridge tops, especially in rock crevices, 75-1800 ft: Avalon, Hamilton, Middle Ranch, and Cottonwood Canyons, Black Jack Mt., old quarry above Empire Landing, Isthmus.

PTEROPSIDA

FILICAE

ASPIDIACEAE

DRYOPTERIS ARGUTA (Kaulf.) Watt. Coastal Wood Fern. Infrequent, shaded canyon bottoms of SE half of island, 150-1000 ft: Pebbly Beach, Big Wash, Hamilton, Gallagher's, Middle Ranch, and Bulrush Canyons.

POLYPODIACEAE

POLYPODIUM CALIFORNICUM Kaulf. [inc. var. *kaulfussii* D. C. Eat.] Polypody. Common over island on rocky outcrops of canyon slopes, banks of gullies, and ocean cliffs, generally in shade, 50-800 ft: Pebbly Beach, Avalon, Hamilton, Middle Ranch, Bulrush, Grand, and Fern Canyons, Emerald Bay.

PTERIDACEAE

ADIANTUM CAPILLUS-VENERIS L. Venus-hair Fern. Infrequent on rocks permanently wet from seepage and water-falls in stream beds of a few canyons of SE half of island, 30-550 ft: Hamilton, Toyon, Middle Ranch below Eagle's Nest, Silver, and Cottonwood Canyons. I found a few plants only in the lower part of Hamilton Canyon below the main fork, 300 ft, 35001, June 23, 1965, and lower part of Toyon (Banning's) Canyon along small stream, 200 ft, 36763, Mar. 19, 1967.

ADIANTUM JORDANII C. Muell. Maidenhair Fern. Common over island in shaded canyon bottoms, 100–1500 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, and Middle Ranch Canyons, Black Jack Mt., Parsons' Landing.

ASPIDOTIS CALIFORNICA Nutt. ex Copel. [*Cheilanthes californica* (Hook.) Mett.] Lace Fern. Infrequent, rocky hillsides, shaded slopes, and mine talus at scattered locations, 800–900 ft: upper end Pebbly Beach Canyon at Renton Mine, Empire Landing, and Johnson's Canyon.

NOTHOLAENA CALIFORNICA D. C. EAT. [*Aleuritopteris cretacea* of authors] Indian Fern. Rare, rocky outcroppings, dry sea-cliffs, and rocks among old Indian Mounds, *Trask*, Mar. 1899 and Feb. 1897 (US); Middle Ranch Canyon 1 mile below Eagle's Nest, *Blakley* 5510, Apr. 7, 1963 (SBBG).

PELLAEA ANDROMEDAEOFOLIA (Kaulf.) Fée. Cliff-brake, Coffee Fern. Frequent over island on dry or partially shaded, rocky canyon slopes, ledges, and ridges, 100–900 ft: Pebbly Beach, Avalon, Hamilton, and Middle Ranch Canyons, W of Empire Landing, Cherry Valley.

PELLAEA MUCRONATA (D. C. Eat.) D. C. Eat. subsp. *MUCRONATA*. Bird's-foot Fern. Infrequent, dry, rocky, open or brushy slopes of SE half of island, 75–900 ft: Pebbly Beach, Avalon, Descanso, Hamilton, Swain's, and Middle Ranch Canyons.

PITYROGRAMMA TRIANGULARIS (Kaulf.) Maxon. Goldenback Fern. Infrequent on SE half of island on dry, rocky or clayey slopes, usually shaded by trees or brush, 100–1400 ft: Pebbly Beach, Avalon, Hamilton, Gallagher's, and Bulrush Canyons, Hay Press area.

PITYROGRAMMA VISCOSA (Nutt. ex D. C. Eat.) Maxon. Frequent over island on dry, rocky or clayey slopes, ledges, and bluffs, 200–1400 ft: Pebbly Beach, Avalon, Swain's, Middle Ranch, Silver, and Cottonwood Canyons, slopes of Black Jack Mt., Cherry Valley.

PTERIDIUM AQUILINUM (L.) Kuhn var. *PUBESCENS* Underw. Western Brake or Bracken. Locally abundant along stream and up both slopes of Fern Canyon SW of Mt. Orizaba at about 750 ft, *Thorne* 36429, May 31, 1966.

SALVINIACEAE

AZOLLA FILICULOIDES Lam. Water Fern. Locally abundant in Middle Ranch and Cottonwood Canyons, forming mats on the surface of shallow water of the small streams in these two canyons.

ANGIOSPERMAE DICOTYLEDONEAE

AIZOACEAE

**APTENIA CORDIFOLIA* (L.) N. E. Br. [*Mesembryanthemum cordifolium* L.] Ice Plant. This prostrate South African perennial is an occasional escape from cultivation in the Avalon area: edge of parking lot, Avalon, *Thorne* 36726, Sept. 17, 1966; base of rocky cliff half mile from Avalon on road to Pebbly Beach, *Wolf* 3431, May 9, 1932.

CARPOBROTUS CHILENSIS (Mol.) N. E. Br. [*Mesembryanthemum aequilaterale* of Millsp. & Nutt.] Sea-fig. Although Millsbaugh and Nuttall observed this native dune perennial "at various points along the eastern coast line," at present it seems to be absent from the few beaches where it might be expected.

**MESEMBRYANTHEMUM CRYSTALLINUM* L. Ice Plant. This succulent, prostrate South African annual is locally abundant on dunes and rocky or clayey slopes near the coast, 6–200 ft: Ben Weston Beach, mouth of Cottonwood Creek, Indian Head Point, Little Harbor, Bird Rock, Parsons' Landing.

**MESEMBRYANTHEMUM NODIFLORUM* L. Another South African prostrate annual, much more common and widely established over island and farther inland from the coast than the preceding species, 6–350 ft: Pebbly Beach, road embankment below Eagle's Nest, Cottonwood Canyon above dam, Indian Head Point, Little Harbor, Bird Rock, Parsons' Landing.

AMARANTHACEAE

**AMARANTHUS ALBUS* L. [*A. graecizans* of Millsp. & Nutt.] Tumbleweed. Infrequent weedy annual of cultivated or otherwise disturbed ground and reservoir margins of SE half of island, 10–1400 ft: Avalon Valley, Wrigley Reservoir, Middle Ranch and reservoir, Ben Weston Beach, Echo Lake.

ANACARDIACEAE

RHUS INTEGRIFOLIA (Nutt.) Benth. & Hook. ex Rothr. [*Neostyphonia integrifolia* (Nutt.) Shafer] Lemonadeberry. Common shrub over island on dry, open to densely-wooded slopes, varying from a small shrub on sea-bluffs to small trees "twenty to twenty-five feet high with trunk a foot in diameter," 15-1600 ft: Seal Rocks, Pebbly Beach, Avalon, Gallagher's, Swain's and Cottonwood Canyons, Black Jack and Orizaba Mts., Ben Weston Beach, Empire Landing, Isthmus, Silver Peak.

RHUS INTEGRIFOLIA (Nutt.) Benth. & Hook. ex Rothr. X *RHUS OVATA* S. Wats. Shrubs intermediate in leaf characteristics between the two presumed parent species were found on rocky chaparral-clad slopes at 800 ft near old quarry above Empire Landing, *Thorne* 33428, Feb. 6, 1964, and in dry arroyo, Salta Verde, *Thorne* 36735, Mar. 18, 1967 (where especially abundant).

RHUS LAURINA Nutt. in T. & G. [*Malosma laurina* (Nutt.) Engl.] Laurel Sumac. Common shrub or small tree over island in canyons and on rocky or clayey, wooded slopes, 15-1600 ft: Pebbly Beach, Avalon, and Middle Ranch Canyons, Black Jack Mt., Isthmus, Parsons' Landing.

RHUS OVATA S. Wats. [*Neostyphonia ovata* (S. Wats.) Abrams] Sugar Bush. Infrequent but sometimes locally abundant shrub or small tree on SE quarter of island; 450-1600 ft: head of Avalon Valley near Wrigley Memorial, ridge WNW of Grand Canyon, bottom of Grand Canyon, upper Bulrush Canyon, dry arroyo of Salta Verde, upper portion of W fork of Gallagher's Canyon along road to Toyon Canyon.

**SCHINUS MOLLE* L. Peruvian Pepper Tree. Small South American tree that occasionally volunteers, apparently from berries carried by birds from cultivated plants: as at Middle Ranch and on E slope of Black Jack Mt.

TOXICODENDRON RADICANS L. subsp. *diversiloba* (T. & G.) n. comb. (based on *Rhus diversiloba* T. & G., Fl. N. Am. 1: 218, 1838) [*Toxicodendron diversilobum* (T. & G.) Greene]. Poison-oak. Frequent, and locally abundant, variable shrub or vine in shade or semi-shade of canyons, wooded slopes, and sea-bluffs of the SE two-thirds of island, 10-1500 ft: upper Pebbly Beach Canyon, Avalon Valley, Moonstone Cove, Black Jack Mt., Empire Landing. The poison-oak is surely only a geographic race, or subspecies, of the widespread and highly variable North American poison-ivy. In susceptible persons it causes the same type of dermatitis.

APOCYNACEAE (incl. ASCLEPIADACEAE)

ASCLEPIAS FASCICULARIS Dcne. in A. DC. Milkweed. Locally abundant perennial only in small temporary ponds (Soapstone Quarries) near Arrow Point above Parsons' Landing, 200-250 ft, *Thorne* 35977, Apr. 7, 1966, and 36678, Sept. 15, 1966.

SARCOSTEMMA CYNANCHOIDES Dcne. subsp. *HARTWEGII* (Vail) R. Holm [*Philibertia hirtella* (Gray) Parish] Very rare suffrutescent perennial vine, apparently not collected since Blanche Trask found it in "one locality, in canyon climbing over *Opuntia*," Feb. 1897 (US).

**VINCA MAJOR* L. Periwinkle. Evergreen European trailing perennial occasionally escaping, or perhaps merely persisting, near buildings and gardens: base of building in lower part of Pebbly Beach Canyon, *Thorne* 33465, Feb. 7, 1964.

ARALIACEAE (incl. APIACEAE)

APIASTRUM ANGUSTIFOLIUM Nutt. in T. & G. Common erect, early annual over island, mostly on rocky sea-bluffs, canyon slopes, and ridges or on grassy slopes, the substrate varying from heavy clay to talus or rock crevices, 10-900 ft: upper Pebbly Beach Canyon, Avalon Valley, Ben Weston Beach, Moonstone Cove, Isthmus.

**BOWLESIA INCANA* Ruiz. & Pav. [*B. septentrionalis* C. & R.] Sprawling annual native to southern South America, probably naturalized in North America, frequent over island in shaded, moist places in canyons and on rocky bluffs, 80-1600 ft: Pebbly Beach, Hamilton, and Middle Ranch Canyons, S slope of Mt. Orizaba, Cherry Valley.

CAUCALIS MICROCARPA H. & A. Frequent annual over SE half of island on shaded to dry and sunny, grassy or rocky slopes, 80-900 ft: Pebbly Beach, Avalon, Middle Ranch, and Cottonwood Canyons.

DAUCUS PUSILLUS Michx. Rattlesnake Weed. Common annual over island on dry, open, grassy or rocky hillsides, sea-bluffs, talus, trail- and road-sides, 15-1600 ft: Jewfish Point,

Avalon Valley, Eagle's Nest, S slope Mt. Orizaba, Little Harbor, above Emerald Bay.

**FOENICULUM VULGARE* Mill. [*F. Foeniculum* (L.) Karst.] Fennel. Stout perennial adventive weed from the Mediterranean region, frequent and locally abundant on SE half of island in fields, on roadsides, in disturbed places generally, and on rocky sea-bluffs, 15–1300 ft: Lookout Point, Avalon, Gallagher's, Swain's, and Middle Ranch Canyons.

SANICULA ARGUTA Greene ex Coult. & Rose [*S. laciniata* H. & A.] Sanicle. Common perennial over island on open, grassy or rocky slopes, ridges, sea-bluffs, substrate varying from heavy clay to talus, 50–1400 ft: Pebbly Beach, Avalon, Gallagher's, Toyon, and Cottonwood Canyons, Isthmus, Howland's Landing.

SANICULA CRASSICAULIS Poepp. ex DC. [*S. Menziesii* H. & A.] Infrequent perennial of shaded canyon bottoms and slopes of SE third of island, 150–900 ft: Pebbly Beach, Avalon, Hamilton, Toyon, Middle Ranch, and Cape Canyons.

**TORILIS NODOSA* (L.) Gaertn. Hedge-parsley. Naturalized weedy annual from Europe established on canyon bottoms and slopes on SE half of island, infrequent, 100–900 ft: upper part of Pebbly Beach Canyon, Avalon Valley near mausoleum, Big Wash Canyon, Middle Ranch Canyon above ranch, White's Landing.

ASTERACEAE

ACHILLEA MILLEFOLIUM L., s. l. [*A. lanulosa* of Millsp. & Nutt.] Yarrow. Frequent perennial of rocky sea-bluffs and sunny, grassy slopes and ridges along coast, 15–500 ft: Pebbly Beach, Avalon, White's Landing, Little Harbor, Isthmus. The specimens seem to fit best the description of *Achillea borealis* Bong. subsp. *californica* (Pollard) Keck, but apparently chromosomes must be counted before a certain determination can be made. Until we know whether the Santa Catalina material is tetraploid or hexaploid, or perhaps both, it seems best to treat our material as the collective species.

AMBLYOPAPPUS PUSILLUS H. & A. Frequent small annual, locally abundant on dry, rocky sea-bluffs and rocky, grassy ridges and slopes along coast, mostly on the Pacific slope and north-western end of the island, upper tide level to 350 ft: mouth of Gallagher's Canyon, Ben Weston Beach, Indian Head Point, Little Harbor, Ballast Point at Isthmus, Parsons' Landing.

**AMBROSIA ACANTHICARPA* Hook. Ragweed. Found only once as "occasional along grassy canyon bottom, Avalon," J. A. Ewan 10808, Oct. 22, 1932. A native California annual but apparently on Santa Catalina an adventive weed not permanently established.

AMBROSIA CHAMISSONIS (Less.) Greene [*Gaertneria bipinnatifida* (Nutt.) Ktze.] Infrequent but locally abundant perennial on dunes and sandy flats behind dunes in coves along coast: Ben Weston Beach, Cottonwood Canyon Beach, Shark and Little Harbors, Moonstone Cove, White's, Parsons' Landings. Both the typical and bipinnatisect forms and intermediates occur together on the island beaches and hardly seem to merit taxonomic recognition although the extreme forms have frequently been treated as subspecies.

AMBROSIA PSILOSTACHYA DC. Western Ragweed. Infrequent but locally abundant weedy perennial in and along stream beds in Middle Ranch and Cottonwood Canyons, 100–800 ft.

**ANTHEMIS COTULA* L. [*Maruta Cotula* (L.) DC.] Dog-fennel. Apparently more abundant on the island formerly, this strong-smelling European annual seems now to be restricted to pastures, reservoir margins, roadsides and other disturbed places at Middle Ranch and down Middle Ranch Canyon toward its mouth.

ARTEMISIA CALIFORNICA Less. California Sagebrush. One of the dominant shrubs of the Coastal Sage Scrub community that covers many of the dry slopes and hilltops about the island, and abundant also on sea-bluffs, grassy openings in the chaparral, and rocky or grassy canyon slopes, 20–1400 ft: Lookout Point, Avalon Valley, White's Landing, E slope Black Jack Mt., Shark Harbor, Isthmus, Howland's Landing.

ARTEMISIA DOUGLASIANA Bess. in Hook. [*A. heterophylla* Nutt., and perhaps *A. vulgaris* of Millsp. & Nutt.] Infrequent but locally abundant, late-blooming perennial of sandy-gravelly soils of stream beds and their banks in Middle Ranch, Cape, and Cottonwood Canyons, 100–900 ft.

ARTEMISIA DRACUNCULUS L. [*A. dracunculoides* Pursh] Rhizomatous perennial, rare and not

recently collected: one canyon, *Trask*, Aug. 1900 (US); floor of Cape Canyon, 230 m, *Fosberg* S5384, 1931 (US, LAM).

BACCHARIS DOUGLASII DC. Mule Fat. Sticky-leaved perennial locally abundant in lower Cottonwood and Middle Ranch Canyons in shallow water and in moist, sandy soil along streams, 50–700 ft.

BACCHARIS EMORYI A. Gray. This shrub has been collected apparently only once on the floor of Pebbly Beach Canyon near its mouth, 5 m, *Fosberg* 7153, Dec. 10, 1931.

BACCHARIS GLUTINOSA Pers. Seep-willow. This slender shrub, about 2 meters tall, was collected only along Cottonwood Creek where crossed by the Isthmus Road, 100 ft, *Thorne* 36671, Sept. 14, 1966. It seems to me doubtfully distinct from *B. viminea*.

BACCHARIS PILULARIS DC. subsp. *CONSANGUINEA* (DC.) C. B. Wolf. Coyote Brush. Infrequent shrub on rocky clay or sandy soils on slopes and ridges or in moister situations of dry stream beds or reservoir margins, mostly on the SE half of island, 50–1500 ft: Wrigley Reservoir, Hay Press area, Little Springs, Swain's, Middle Ranch and Fern Canyons, and above Empire Landing.

BACCHARIS VIMINEA DC. Mule Fat. Infrequent shrub of canyon bottoms, mostly along streams, on the SE half of island, 65–400 ft: Avalon, Big Wash, Hamilton, and Cottonwood Canyons.

BRICKELLIA CALIFORNICA (T. & G.) A. Gray. Frequent small shrub of SE half of island on rocky, sunny slopes and steep cliffs, 50–600 ft: Lookout Point, Avalon, Middle Ranch, Grand, and Cottonwood Canyons, White's Landing.

**CENTAUREA CINERARIA* L. Dusty Miller. Well-established and locally abundant perennial, escaped from cultivation in and about Avalon, 15–300 ft: Wrigley Drive, Avalon, ridge between Descanso and Hamilton Canyons, Airport Road W of Avalon.

**CENTAUREA MELITENSIS* L. Tocalote, Star-thistle. Common European annual weed abundantly and widely established on the island in waste places and in many sunny habitats, 10–1500 ft: Pebbly Beach Canyon, Avalon Valley, Ben Weston Beach, White's Landing, S slope Mt. Orizaba, above Emerald Bay, Parsons' Landing.

**CENTAUREA SOLSTITIALIS* L. Barnaby's-thistle. Another, more noxious European weedy annual, fortunately established only in a limited area at Middle Ranch, about 700 ft: *Fosberg* S5401, July 14, 1931 (LAM) and *Thorne* 36624, Sept. 14, 1966.

CHAETOPAPPA LYONII (Gray) Keck [*Pentachaeta Lyoni* Gray] Very rare ephemeral annual, collected last by F. R. Fosberg, S5416, July 15, 1931 (LAM), on a dry NW slope at 20 m at the Isthmus. Known elsewhere only from coastal Los Angeles Co. and the Santa Monica Mts.

**CHRYSANTHEMUM CORONARIUM* L. Mediterranean annual last collected on Catalina by F. R. Fosberg on an Avalon roadside at 50 m, S4856, May 12, 1931 (LAM).

**CHRYSANTHEMUM FRUTESCENS* L. Another escape, native to the Canary Islands, that I was unable to find though Millspaugh and Nuttall reported it as "fully established" at Avalon: roadsides and waste places, *Millspaugh* 4728, Mar. 8, 1920 (F).

CIRSIUM CALIFORNICUM A. Gray. Infrequent native biennial thistle of sunny, rocky canyon slopes, rocky ridges, or grassy slopes of the SE third of island, 25–300 ft: Pebbly Beach, canyon behind Bird Park, ridge between Descanso and Hamilton Canyons, mouth of Gallagher's Canyon.

CIRSIUM OCCIDENTALE (Nutt.) Jeps. Another native biennial thistle much more common and widely distributed over island in dry, sunny, rocky places, 10–1700 ft: Pebbly Beach, Avalon, Middle Ranch, and Fern Canyons, SW slope of Black Jack Mt., above Empire Landing, Howland's Landing.

**CIRSIUM UNDULATUM* (Nutt.) Spreng. Although a native western thistle, this perennial was probably adventive on the island. Only Alice Eastwood found it on Santa Catalina Island,

Fig. 20. Wild-Apple, *Crossosoma californicum*, also endemic to Santa Catalina, San Clemente, and Guadalupe Islands. Note perigynous flowers with numerous stamens, white, clawed petals, and apocarpous gynoecium. Follicles at left nearly mature and containing arillate seeds.



Fig. 19. Bush-Snapdragon, *Galvesia speciosa*, with bright red corollas borne the year-round. Endemic to Santa Catalina, San Clemente, and Guadalupe Islands, and here found hanging from sea-cliffs on the Channel slope.

July 20–25, 1917, no. 6510 (CAS). It had earlier been identified and reported as *C. ochrocentrum* A. Gray.

**CIRSIIUM VULGARE* (Savi) Ten. Bull Thistle. This Eurasian biennial is still extant on the island and is locally abundant at Middle Ranch, especially on the disturbed ground above the reservoir, 650 ft, *Thorne* 36627, Sept. 14, 1966.

COREOPSIS GIGANTEA (Kell.) Hall. Sea-dahlia. This unusual, fleshy, thick-stemmed shrub is frequent on sea-bluffs and rocky ridges near the coast, 25–300 ft: Pebbly Beach, mouth of Hamilton Canyon, Moonstone Cove, lower Middle Ranch Canyon, old quarry above Empire Landing, Bird Rock, Parsons' Landing. This species would probably be much more widespread on the island and in more accessible locations if the feral goats were eliminated.

CORETHROGYNE FILAGINIFOLIA (H. & A.) Nutt. var. *VIRGATA* (Benth.) A. Gray. Infrequent perennial of dry, sunny, rocky, grassy, or eroded clayey slopes and sea-bluffs about island, 15–1400 ft: along Wrigley Drive above Pebbly Beach, around Wrigley Reservoir, near Hay Press Reservoir, between Isthmus and Fisherman's Cove. Although this species is most variable, the Catalina specimens seem to match best the description of var. *virgata*.

**COTULA AUSTRALIS* (Sieb. ex Spreng.) Hook. f. Weedy adventive annual from Australia found established at three stations: vacant lot in Avalon, 10 m, *Fosberg* 54506, April 8, 1931; desiccated swale along roadside at Toyon Picnic Grounds, 1400 ft, *Thorne* 34664, May 11, 1965, and lower part of Toyon Canyon, Mar. 19, 1967.

**COTULA CORONOPHILIA* L. South African native perennial widely established in shallow water, wet mud or sand, and other moist places about island, 10–1100 ft: reservoirs in Cape and Cottonwood Canyons, lower Middle Ranch and Bulrush Canyons, Little Harbor, near Empire and Parsons' Landings.

ENCELLA CALIFORNICA Nutt. Common, abundant, conspicuous low shrub over island, particularly on sea-bluffs and dry, rocky canyon slopes and ridges in the coastal sage scrub, 15–1500 ft: East Mountain, Lookout Point, Avalon Valley, Bulrush Canyon, Indian Head Point, Little Harbor, White's and Empire Landings, Isthmus, Cherry Valley, Parsons' Landing.

**ERIGERON BONARIENSIS* L. [*Leptilon linifolium* (Willd.) Small] Infrequent weedy annual adventive in this country from South America, established at scattered points, 10–600 ft: Avalon, below Eagle's Nest in lower Middle Ranch Canyon, Little Harbor.

**ERIGERON CANADENSIS* L. [*Leptilon canadense* (L.) Britton] Horseweed. Annual weed native to the eastern United States, infrequent about island in weedy places, 15–1400 ft: Rock Spring, Middle Ranch, and Cottonwood Canyons, Wrigley Reservoir, Little Harbor, old quarry above Empire Landing.

ERIGERON DISCOIDEUS Kell. [*Conyza coulteri* Gray] Annual not collected in recent years but recorded by Millspaugh and Nuttall from "moist or rich soil": Avalon vicinity, *McClatchie*, Sept. 8, 1893 (F); ascending 2–6 ft among shrubs, Middle Ranch, *Millspaugh* 4602, Jan. 19, 1920 (F). Also reported from Empire Landing.

ERIGERON FOLIOSUS Nutt. Fleabane. Infrequent perennial largely restricted to Avalon vicinity, 125–700 ft: lower and upper Avalon Canyon, canyon behind Bird Park, Hamilton Canyon. The narrower-leaved specimens of this variable species have been treated as the var. *stenophyllum* (Nutt.) A. Gray.

ERIOPHYLLUM CONFERTIFLORUM (DC.) A. Gray var. *CONFERTIFLORUM*. Frequent small shrub about island on sea-bluffs and in coastal sage scrub on dry canyon slopes, 25–500 ft: Pebbly Beach, Avalon, Middle Ranch, and Hamilton Canyons, mouth of Gallagher's Canyon, Little Harbor, Isthmus, Parsons' Landing.

ERIOPHYLLUM NEVINII A. Gray. Dusty Miller. Infrequent shrub on Channel sea-bluffs, locally abundant in Avalon area, 20–100 ft: bluffs between Pebbly Beach and Avalon Bay and between Avalon Bay and Descanso Bay, mouth of Hamilton Canyon, Indian Rock in Emerald Bay. This beautiful shrub, endemic to Santa Catalina, Santa Barbara, and San Clemente Islands, does resemble the introduced Dusty Miller, and both species can be observed growing together on the Avalon bluffs.

FILAGO ARIZONICA A. Gray. Probably more frequent annual on island than the following three locations would indicate, 200–1450 ft: Isthmus on grassy W-facing slope of bluff SE of Ballast Point, Hay Press area on hard desiccated clay surface of temporary pool, and disturbed ground near dam at Middle Ranch.

FILAGO CALIFORNICA Nutt. Common small annual over island on dry, sunny, rocky, grassy, or eroded clayey slopes and ridges, 50–1700 ft: Pebbly Beach, Avalon, Gallagher's, and Cottonwood Canyons, W slope Black Jack Mt., Isthmus, Cherry Valley.

**FILAGO CALICA* L. Small naturalized European annual found just twice: dry, eroded, grassy, adobe hillside along Airport Rd. before junction with Middle Ranch Rd., 1500 ft, *Thorne* 36301, Apr. 29, 1966; grassy slopes above Gallagher's Canyon, E fork, about 1400 ft, *Thorne* 36356, Apr. 30, 1966.

GNAPHALIUM BICOLOR Bioletti. Everlasting. Biennial or perennial common over entire island on dry, sunny, rocky or clayey, grassy or partially wooded slopes, 20–1700 ft: Pebbly Beach, Avalon Valley, W slope Black Jack Mt., W of Empire Landing, Little Harbor, Isthmus, Johnson's Landing.

GNAPHALIUM CALIFORNICUM DC. Infrequent perennial in canyons and on clayey slopes in chaparral and coastal sage scrub, 50–1350 ft: Pebbly Beach, Hamilton, and Middle Ranch Canyons, E slope of Black Jack Mt., Camp Frost.

GNAPHALIUM CHILENSE Spreng. Frequent erect annual or biennial on SE half of island on open or shrubby, dry, rocky or clayey slopes and margins of reservoirs and dry, sandy stream beds, 15–1350 ft: Avalon, Gallagher's, and Cottonwood Canyons, Hay Press Reservoir, E slope Black Jack Mt., old quarry above Empire Landing.

**GNAPHALIUM LUTEO-ALBUM* L. European annual weed found in only three locations, 10–1430 ft: sand along stream in lower part of Cottonwood Canyon, sandy disturbed area behind Ben Weston Beach, and margin of lower Buffalo Springs Reservoir.

GNAPHALIUM MICROCEPHALUM Nutt. Rare biennial or perennial, not recently collected: semishade near Renton Mine at head of right fork of Pebbly Beach Canyon, 900 ft, *Wolf* 4211, Oct. 3, 1932.

GNAPHALIUM PALUSTRE Nutt. Infrequent sprawling annual on desiccated muddy margins of reservoirs and temporary pools, 150–1400 ft: Wrigley and Hay Press Reservoirs, Echo Lake, pond between Little Harbor and Cottonwood Creek, old quarry above Empire Landing.

GNAPHALIUM PURPUREUM L. Infrequent erect annual or biennial on SE half of island on dry, rocky or eroded, clayey slopes or desiccated margins of reservoirs, 400–1400 ft: Avalon Valley, Hay Press area, E slope Black Jack Mt., Echo Lake, Bulrush Canyon.

GRINDELIA ROBUSTA Nutt. Reported by Millspaugh and Nuttall as collected by Knopf (493, Aug. 13, 1922) from the upper end of Middle Ranch Canyon. Apparently not seen since then.

HAPLOPAPPUS SQUARROSUS H. & A. subsp. *GRINDELIODES* (DC.) Keck [*Hazardia squarrosa* (H. & A.) Greene] Frequent suffruticose perennial of open, sunny, rocky or clayey slopes on Channel slope, 25–1200 ft: Pebbly Beach, Avalon, and Swain's Canyons, Isthmus.

HAPLOPAPPUS VENETUS (H.B.K.) Blake subsp. *FURFURACEUS* (Greene) Hall. Common sprawling shrub along Pacific coast of island on sandy or pebbly beaches and flats and rocky cliffs and talus of sea-bluffs, much less frequent inland on rocky clay or rocky sandy soils, 5–1400 ft: Palisades near Jewfish Point, Ben Weston Beach, Cottonwood Canyon Beach, Little Harbor, Wrigley Reservoir, Catalina Harbor.

HAPLOPAPPUS VENETUS (H.B.K.) Blake subsp. *VERNONIODES* (Nutt.) Hall [*Isocoma vernonioides* Nutt.] This subspecies is apparently rather rare on the island for I found it only on a dry, sunny hillside near the upper Buffalo Springs Reservoir, 1450 ft, *Thorne* 36705, Sept. 16, 1966.

HELENIUM PUBERULUM DC. Sneezeweed. Very rare perennial, not recently collected: waterfall, few plants, 1–6 ft tall, *Trask*, June 1898 (US); also reported by Millspaugh and Nuttall from "creek-bed of canyon above Chicken Johnny's."

**HELIANTHUS ANNUUS* L. subsp. *LENTICULARIS* (Dougl. ex Lindl.) Cockerell. Sunflower. Presumably introduced at the one location where collected by L. W. Nuttall, reservoir field, May 28, 1920, no. 569.

HEMIZONIA CLEMENTINA Brandeg. Common insular half-shrub on dry, rocky sea-cliffs on all coasts of island, rare inland on rocky bluffs, 10–600 ft: Lookout Point, Avalon Bay, Gallagher's and White's Landings, Cottonwood Canyon, Little Harbor, Isthmus. Elsewhere known only from San Clemente, San Nicolas, Santa Barbara, and Anacapa Islands.

HEMIZONIA FASCICULATA (DC.) T. & G. [inc. *H. ramosissima* Benth.] Annual common everywhere, and often abundant, on dry, open, sunny, rocky, grassy, and eroded clayey slopes over island, 15–1250 ft: Wrigley Drive, Avalon, Swain's, Middle Ranch, and Cottonwood Canyons, Little Harbor, Isthmus, Parsons' Landing. The plants with less clustered heads, more frequent on Santa Catalina, are often segregated as var. *ramosissima* (Benth.) Gray. Surely this variant does not deserve specific ranking.

HETEROTHECA GRANDIFLORA Nutt. Frequent stout annual or biennial of dry, sunny, rocky or grassy slopes and disturbed roadsides on the SE half of island, 150–1400 ft: Avalon, Rock Spring, Descanso, and Hamilton Canyons, Wrigley Reservoir, Hay Press area, E slope Black Jack Mt.

**HYPOCHOERIS GLABRA* L. Apparently rare Eurasian-African weedy annual established on the summit of island: dry, eroded, grassy, clayey hillside along Airport Rd. before junction with road to Middle Ranch, 1400 ft, *Thorne* 36305, Apr. 29, 1966; also observed May 31, 1966, on the slope of Mt. Orizaba.

JAUMEA CARNOSA (Less.) Gray [*Coinogyne carnosa* Less.] Rare but locally abundant succulent perennial in salinas at Shark and Little Harbors and inside Ballast Point on the E side of Catalina Harbor.

**LACTUCA SERRIOLA* L. [*L. virosa* L.] Prickly Lettuce. Eurasian-African biennial weed found at only two locations: along main road near N part of Swain's Canyon, 1250 ft, *M. Piehl* 62491, Oct. 3–6, 1962 (SBBG); near temporary pool above Ranch in Middle Ranch Canyon, 750 ft, *Thorne* 36276, Apr. 29, 1966.

LASTHENIA CHRYSOSTOMA (F. & M.) Greene subsp. *CHRYSOSTOMA* [*Baeria chrysostoma* F. & M.] Gold Fields. Common annual, often so abundant as to color hillsides golden, on open, sunny, grassy or bare, clayey or rocky slopes and ridges, 200–1400 ft: Pebbly Beach Canyon, upper Avalon Valley, White's Landing, E slope Black Jack Mt., Cape Canyon, Ben Weston Beach, Little Harbor, above Empire Landing, Isthmus, Parsons' Landing.

LAYIA PLATYGLOSSA (F. & M.) A. Gray subsp. *CAMPESTRIS* Keck. [*Blepharipappus platyglossus* (F. & M.) Greene] Tidy-tips. Common annual, often with *Lasthenia* on open, sunny, grassy, clayey, or rocky slopes and ridges over NW three-quarters of island, 50–1300 ft, apparently absent SE of the Hay Press area: Bulrush, Gallagher's, Cape, and Cottonwood Canyons, Hay Press area, Isthmus, White's, Empire, and Johnson's Landings.

MADIA EXIGUA (Sm.) A. Gray. Tar-weed. Common small annual over island in dry, sunny, open places, especially on dry, eroded, clayey slopes, 15–1600 ft: Avalon, Middle Ranch, and Bulrush Canyons, slopes of Black Jack and Orizaba Mts., Isthmus, Parsons' Landing.

MADIA GRACILIS (Sm.) Keck. [*M. dissitiflora* (Nutt.) T. & G.] Frequent annual of dry, sunny, grassy or shrubby hillsides, rocky banks and talus, and eroded, clayey slopes of Channel slope, 15–1400 ft: Pebbly Beach Canyon, Avalon Bay, mouth of Gallagher's Canyon, Hay Press area, Emerald Bay.

MADIA SATIVA Mol. Frequent annual of rocky bluffs and grassy openings in oak woodlands and chaparral of SE half of island, 25–850 ft: upper Pebbly Beach and Avalon Canyons, junction of Cape and Middle Ranch Canyons, White's Landing.

MALACOTHRIX SAXATILIS (Nutt.) T. & G. var. *TENUIFOLIA* (Nutt.) A. Gray. Snake's Head. Common tall perennial of Channel sea-bluffs, rare on rocky slopes inland, 15–900 ft: Lookout Point, upper Pebbly Beach Canyon, Avalon Bay, mouth of Hamilton Canyon, Isthmus Harbor.

**MATRICARIA MATRICARIODES* (Less.) Porter. Pineapple Weed. Infrequent annual weed, perhaps native to NE Asia, found in a vacant lot in Avalon, on roadsides and disturbed ground near the dam at Middle Ranch, and in Toyon Canyon.

MICROSERIS DOUGLASII (DC.) Sch.-Bip. subsp. *PLATYCARPHA* (Gray) K. Chamb. Rare annual of open, dry, grassy, clayey or rocky slopes of central portion of island: near junction of Airport and Middle Ranch Roads, 1500 ft, *Thorne* 36302, Apr. 29, 1966; 1 mile W of Empire Landing, 700 ft, *Thorne* 35935a, Apr. 6, 1966; near Blue Cavern Point NE of Isthmus Cove, 100 ft, *Thorne* 35778, Apr. 4, 1966.

MICROSERIS HETEROCARPA (Nutt.) K. Chamb. [*M. Lindleyi* (DC.) Gray] Infrequent annual of open, dry, grassy or rocky slopes or openings in coastal sage scrub, mostly on Channel slope, 25–1300 ft: mouth of Gallagher's Canyon, E slope Black Jack Mt., west of Empire



Fig. 21. Plant of the very rare island endemic, *Helianthemum greenei*, with branches of *H. scoparium* (center right) and putative hybrid between the two species (center left), all found growing together on open slope in Swain's Canyon.
Fig. 22. Mr. Percy Everett standing beside large specimen of St. Catherine's Lace, *Eriogonum giganteum giganteum*, endemic to Santa Catalina Island, in bottom of Hamilton Canyon.

Landing, Isthmus Harbor, near Ballast Point.

MICROSERIS LINEARIFOLIA (Nutt.) Sch.-Bip. Frequent annual of open, sunny, grassy slopes, dry, rocky banks and talus, and openings in chaparral, on Channel slope, 15–1600 ft: Avalon, upper Pebbly Beach, and Gallagher's Canyons, slopes of Black Jack and Orizaba Mts., Johnson's Canyon.

PEREZIA MICROCEPHALA (DC.) A. Gray. Common robust perennial over island in oak woodlands, chaparral, and on dry, open, rocky slopes, 50–900 ft: upper Pebbly Beach, Avalon, Swain's and Cottonwood Canyons, Ironwood Gully at Isthmus, Parsons' Landing.

PERITYLE EMORYI Torr. Frequent small annual or biennial mostly of the NW half of island on rocky sea-bluffs, 10–300 ft: Lookout Point, below Eagle's Nest in Middle Ranch Canyon, Indian Head Point, near Ballast Point at Catalina Harbor, Cherry Valley, Parsons' Landing.

**PICRIS ECHIOIDES* L. Bristly Ox-tongue. Weedy Mediterranean annual established only in weedy flat area along Isthmus road back of salina at Little Harbor, 15 ft elev., *Thorne* 36450, May 31, 1966, and 36664, Sept. 14, 1966.

PLUCHEA PURPURASCENS (Sw.) DC. [*P. camphorata* (L.) DC.] Robust annual or perennial found only above Parsons' Landing in marshy depressions, where abundant, 150 ft, *Thorne* 36677, Sept. 15, 1966; earlier found here (wet spot in Soap Stone Quarry) by Nuttall (US) and by Trask in "one locality, canyon," Aug. 1897 (US).

PLUCHEA SERICEA (Nutt.) Cov. Arrow-weed. Very rare shrub, most recently collected at Pebbly Beach, dry salt marsh, *Fosberg* 54479, April 3, 1931. The salina at Pebbly Beach has been replaced by the freight terminal for the island, probably extirpating this and several other species formerly known only there.

PSILOCARPHUS TENELLUS Nutt. var. *TENELLUS*. Tiny annual found only on bare, eroded, clayey slope S of Parsons' Landing and SW of Arrow Point, 200 ft, *Thorne* 35987, Apr. 7, 1966. Reported by Millsbaugh and Nuttall also from Avalon, Summit, and Cherry Canyon.

RAFINESQUIA CALIFORNICA Nutt. Frequent robust annual of Channel slope on rocky, dry slopes and ridges, open grassland, and shaded canyon bottoms, 50–850 ft: upper end Pebbly Beach Canyon, Avalon Valley, Moonstone Cove, Cherry Valley, and above Emerald Bay.

SENECIO DOUGLASHII DC. var. *DOUGLASHII*. Rare perennial not recently collected on the island. Reported by Millsbaugh and Nuttall as "common in washes and other gravelly places," but I have seen only Nuttall's two collections from Pebbly Beach: among shore pebbles, *Nuttall* 287, June 2, 1920 (F) and 794, Aug. 17, 1920 (F). This species may be another botanical casualty of the conversion of Pebbly Beach into a commercial terminal.

SENECIO LYONII A. Gray. Island Ragwort. Frequent suffrutescent perennial in semi-shade of chaparral, oak woodland, or coastal sage scrub or less commonly on dry, rocky bluffs, 50–700 ft: Pebbly Beach, Middle Ranch, and Little Springs Canyon, W of Empire Landing, Isthmus. Known otherwise only from San Clemente Island and from Isla San Martín and adjacent Bahía de San Quintín, Baja California.

**SENECIO VULGARIS* L. Common Groundsel. Rare European annual weed: along road to Renton Mine, Pebbly Beach Canyon, 800 ft, *Thorne* 36209, Apr. 28, 1966; dry, thinly-grassed rocky slope, lower end Bulrush Canyon, 600 ft, *Thorne* 36751, Mar. 18, 1967.

**SILYBUM MARIANUM* (L.) Gaertn. Milk-thistle. Noxious Mediterranean annual or biennial weed established at several points on the island, 90–150 ft: Gallagher's Canyon, above reservoir in lower Cottonwood Canyon, roadside between Cherry Valley and Howland's Landing.

SOLIDAGO CALIFORNICA Nutt. Goldenrod. Rare perennial found only as one patch on a dry, W-facing grassy hillside at Middle Ranch, 700 ft, *Thorne* 36703, Sept. 15, 1966.

**SONCHUS ASPER* L. Prickly Sow-thistle. Eurasian-North African weedy annual infrequent in weedy places, mostly in canyons, scattered over island, 50–1000 ft: Pebbly Beach, Hamilton, and Middle Ranch Canyons, Parsons' Landing.

**SONCHUS OLERACEUS* L. Sow-thistle. Another, more frequent, Eurasian-North African weedy annual, well established over the island in many and various habitats, 15–850 ft: Pebbly Beach, Avalon, and Cottonwood Canyons, Little Harbor, Bird Rock, Cherry Valley.

**SONCHUS TENERRIMUS* L. Rare adventive annual on the California islands from Europe, not recently collected on Catalina: dry bed of stream, canyon S of Chicken Johnny's, Avalon, *Millsbaugh* 4544, Jan. 6, 1920 (F). At least three other specimens identified as this species

proved to be *Rafinesquia californica* and *Sonchus oleraceus*.

STEPHANOMERIA EXIGUA Nutt. Small annual found in three places by Fosberg at low elevations, 5–10 m: Pebbly Beach roadside, 7147, Dec. 10, 1931 (LAM); Avalon, ocean bluffs, S4460, April 3, 1931 (LAM); and Isthmus, dry west slope, S5417, July 15, 1931 (LAM).

STEPHANOMERIA VIRGATA Benth. More frequent, taller annual of dry, rocky or grassy slopes and roadsides of the SE half of island, 15–900 ft: upper Pebbly Beach, Avalon, Descanso, and Middle Ranch Canyons, roadside between Cottonwood Canyon and Little Harbor.

STYLOCLINE GNAPHALODES Nutt. Infrequent small annual of dry, open, sunny, eroded, clayey slopes on the SE half of island, 600–1700 ft: upper Avalon, Gallagher's, Swain's and Bulrush Canyons, Hay Press area, W slope of Black Jack Mt.

**TARAXACUM LAEVIGATUM* (Willd.) DC. Red-seeded Dandelion. European perennial weed found only in a lawn at Middle Ranch, 700 ft, *Thorne* 36698, Sept. 16, 1966.

**TARAXACUM OFFICINALE* Weber. Common Dandelion. Found after diligent search in lawn of the razed St. Catherine's Hotel in Descanso Canyon, June 1, 1966, but then lost in press. The rarity of both these usually common perennial lawn weeds attests to the scarcity of lawns on Catalina.

**THELESPERMA MEGAPOTAMICUM* (Spreng.) Kuntze [*T. gracile* (Torr.) A. Gray] Slender perennial native to the Southwest and to southern South America, not recently collected though found July 10, 1920, in Avalon Valley, along the road beyond the saw-mill, *Nuttall* 602 (F).

**XANTHIUM SPINOSUM* L. Spiny Clothbur. All too frequent weedy annual in disturbed places and in canyon bottoms along streams or near reservoirs, 100–750 ft: Hamilton, Middle Ranch, Cape, Gallagher's, and Swain's Canyons, and old quarry above Empire Landing.

XANTHIUM STRUMARIUM L. [*X. pennsylvanicum* Wallr.] Cocklebur. Frequent coarse annual of sandy beaches and stream beds and silty margins of reservoirs, 5–1400 ft: Wrigley Reservoir, Swain's Canyon, Buffalo Springs Reservoir, Ben Weston Beach, Cottonwood Canyon beach, Little Harbor dunes, Isthmus Harbor. This species may be native or may be an adventive weed.

BORAGINACEAE

AM SINCKIA INTERMEDIA F. & M. [*A. Douglasiana* of Millsp. & Nutt.] Common Fiddleneck. Common annual over island on dry, grassy slopes, sandy stream beds, grain fields, and disturbed ground, 100–1350 ft: Pebbly Beach, Avalon, Gallagher's, Middle Ranch, Bulrush, and Cottonwood Canyons, Isthmus, Cherry Valley.

AM SINCKIA MENZIESII (Lehm.) Nels. & Macbr. [*A. parviflora* Heller] Infrequent annual of grassy or dry, rocky slopes or disturbed ground, 50–1400 ft: Wrigley Reservoir, Moonstone Cove, Middle Ranch near dam, Cottonwood Canyon.

CRYPTANTHA CLEVELANDII Greene [possibly *C. leiocarpa* of Millsp. & Nutt.] Very common annual over island on dry, sunny, grassy, clayey or rocky slopes, ridges, ledges, and sea-bluffs, 10–1900 ft: Pebbly Beach, Avalon, Gallagher's, Cape, Middle Ranch, Grand, and Cottonwood Canyons, S slope Mt. Orizaba, Ben Weston Beach, Little Harbor, between Cherry Valley and Howland's Landing.

CRYPTANTHA INTERMEDIA (A. Gray) Greene. Infrequent annual on dry, rocky or grassy slopes, mostly on NW half of island, 50–300 ft: Moonstone Cove, old quarry above Empire Landing, Isthmus, Cherry Valley, Emerald Cove.

CRYPTANTHA MARITIMA (Greene) Greene [*C. ramosissima* Greene] Infrequent annual of dry, rocky bluffs and dry, grassy slopes of western bulge of island, 50–350 ft: Little Harbor and lower Cottonwood Canyon.

CRYPTANTHA MICROMERES (A. Gray) Greene. Rare annual: dry slope, Salta Verde, *Thorne* 36872a, May 18, 1967. Also reported by Millspaugh and Nuttall from dry, open hillsides, Equestrian Trail and "Ham Spring No. 2."

CRYPTANTHA MICROSTACHYS (A. Gray) Greene. Also apparently rare annual on Santa Catalina, for I have seen only one specimen: Santa Catalina Island, California, July 15, 1888, Dr. H. E. Hasse (DS).

HARPAGONELLA PALMERI A. Gray. Frequent small annual of dry, rocky or eroded, clayey slopes over island, 45–900 ft: Descanso, Hamilton, Bulrush, and Cottonwood Canyons, Pacific Divide, Salta Verde, E slope Black Jack Mt., Cherry Valley.

HELIOTROPIUM CURASSAVICUM L. var. *OCULATUM* (Heller) I. M. Johnst. ex Tidestrom. [*H. chenopodioides* Willd.] Wild Heliotrope. Frequent, rather succulent perennial on saline sand, mud, or pebbles of salinas, beaches, and stream beds or mouths along Pacific shore, 4–50 ft: Ben Weston Beach, mouth of Cottonwood Canyon, Little and Shark Harbors, Little Springs Canyon, Ballast Point in Catalina Harbor at Isthmus.

PECTOCARYA LINEARIS DC. var. *FEROCULA* I. M. Johnst. Frequent annual of dry, bare, clayey or rocky ridges and slopes of SE half of island, 500–1500 ft: Hamilton Canyon, Pacific Divide, viewpoint near Wrigley Reservoir, Hay Press area, Echo Lake, Cape Canyon, Bulrush Ridge.

PECTOCARYA PENICILLATA (H. & A.) A. DC. Extremely rare annual, not recently collected: without definite locality, G. B. Grant, June 1902 (US).

PLAGIOBOTHRYS CALIFORNICUS (Gray) Greene var. *GRACILIS* I. M. Johnst. Infrequent annual on bare or lightly-grassed, hard-packed clay soils on island's summit, 1400–1700 ft: Viewpoint near Wrigley Reservoir, Toyon Picnic Ground, slopes of Black Jack Mt., right fork of Cottonwood Canyon, Rancho Escondido.

PLAGIOBOTHRYS CANESCENS Benth. [inc. *P. arizonicus* (Gray) Greene var. *catalinensis* Gray] Frequent annual of bare, rocky ridges, dry, eroded, clayey slopes, or dry stream beds over island, 6–1900 ft: mouth of Hamilton Canyon, Wrigley Reservoir, Hay Press area, peak of Mt. Orizaba, Gallagher's, Middle Ranch, Bulrush, and Grand Canyons, Parsons' Landing.

BRASSICACEAE

ATHYSANUS PUSILLUS (Hook.) Greene. Rare slender annual: "infrequent in shade in canyons," Trask, Apr. 1900 (US), grassy shaded slopes under *Quercus dumosa* at lower end of Bulrush Canyon, 650 ft, P. H. Raven, May 21, 1962, and Thorne, Rollins, et al 36749, Mar. 18, 1967.

**BRASSICA GENICULATA* (Desf.) J. Ball [*Hirschfeldia incana* (L.) Lagreze-Fossat] Mediterranean weedy biennial or perennial found established only in Middle Ranch Canyon on roadside at Middle Ranch, 200 m, Fosberg S5378, July 11, 1931 (LAM), and roadbank above stream in lower part of canyon about $\frac{3}{4}$ mile above Ben Weston Beach, 175 ft, Thorne 36639, Sept. 14, 1966.

**BRASSICA KABER* (DC.) L. C. Wheeler [*Sinapis arvensis* L.] Wild Mustard, Charlock. Eurasian-North African weedy annual established in Pebbly Beach area and on Middle Ranch.

**BRASSICA NIGRA* (L.) Koch. Black Mustard. Old World weedy annual found at infrequent intervals on roadsides and in disturbed ground, 15–700 ft: Avalon, below Eagle's Nest, roadside between Middle Ranch and Cottonwood Canyons, Little Harbor.

**BRASSICA RAPA* L. subsp. *CAMPESTRIS* (L.) Clapham [*B. campestris* L.] Field Mustard. Old World weedy biennial established in the Pebbly Beach area and at Middle Ranch on roadsides and in disturbed ground.

**CAKILE MARITIMA* Scop. Sea-rocket. European succulent annual well-established on the infrequent sandy beaches about island: White's Landing, Ben Weston and Cottonwood Canyon Beaches, Shark and Little Harbors, Parsons' Landing.

**CAPSELLA BURSA-PASTORIS* (L.) Medic. [*Bursa Bursa-pastoris* (L.) Britt.] Shepherd's Purse. Frequent annual weed, probably originally native to the Mediterranean region, on roadsides, grassy, clayey slopes, and disturbed ground about island, 40–1400 ft: Renton Mine, Avalon, Gallagher's, Toyon, and Bulrush Canyons, Echo Lake, Isthmus, Cherry Valley.

CARDAMINE CALIFORNICA (Nutt.) Greene [*C. paucisecta* Benth., *Dentaria californica* Nutt.] Glabrous perennial found only in Cherry Valley in moist deep shade of *Prunus ilicifolia lyonii* forest, 200 ft, Thorne 35962, Apr. 7, 1966.

DESCURAINIA PINNATA (Walt.) Britt. subsp. *MENZIESII* (DC.) Detl. [*Sophia pinnata* (Walt.) Howell] Tansy Mustard. Infrequent annual of dry roadsides and disturbed ground, 50–250 ft: firebreak S of Avalon Valley, White's Landing, Middle Ranch Canyon below Eagle's Nest, old quarry W of Empire Landing.

DRABA CUNEIFOLIA Nutt. ex T. & G. var. *INTEGRIFOLIA* Wats. Rare annual, not recently collected: "sandy broken sea edges near Avalon," Trask, Apr. 1902, herb. no. 1877 (LAM).

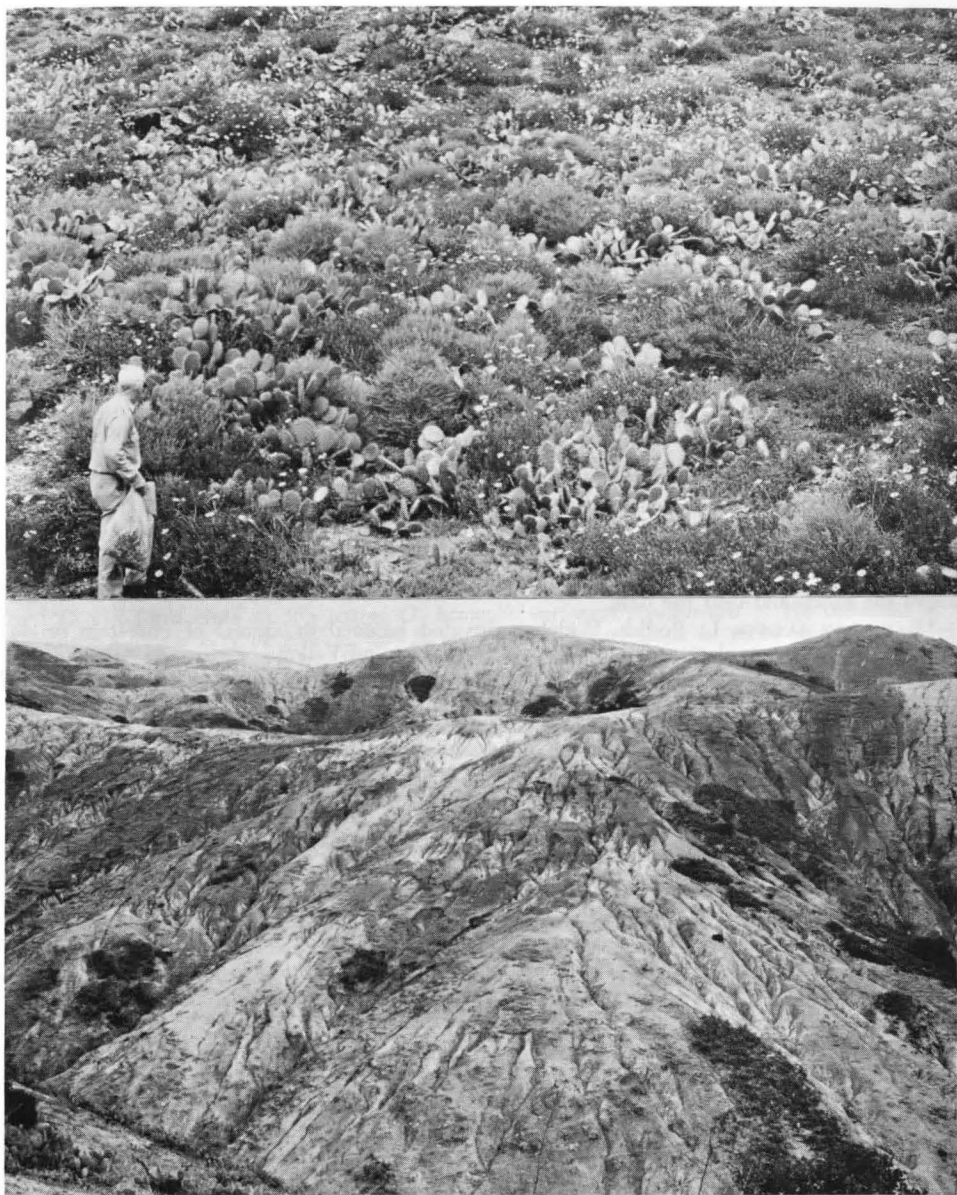


Fig. 23. Mr. Percy Everett at base of S-facing rocky slope at N side of Little Harbor beach. The slope is covered with coastal sage scrub with *Opuntia littoralis et al*, *Encelia californica* (in bloom), *Artemisia californica*, and *Lycium californicum*.

Fig. 24. Ravaged slopes in upper Bulrush Canyon - Silver Canyon area illustrating gully erosion due to over-grazing by goats.

**ERYSIMUM CHEIRI* (L.) Crantz. Wallflower. Mediterranean perennial garden escape established along road from Avalon to Pebbly Beach, 10 ft, *Thorne* 33447, Feb. 7, 1964.

LEPIDIUM LASIOCARPUM Nutt. var. *LASIOCARPUM*. Hairy Peppergrass. Infrequent small annual of dry, sunny, rocky or clayey slopes and sand dunes, western bulge of island, 15–700 ft: Rancho Escondido, lower Cottonwood Canyon and beach bluff at its mouth, Little Harbor dunes.

LEPIDIUM LATIPES Hook. Rare prostrate annual of saline places or clayey vernal pools, not recently collected: “two localities, one saline marsh, other 1500 ft elevation,” *Trask*, Mar. 1901 (US); wet saline soil, Pebbly Beach, *F. W. Johnston*, Mar. 23, 1910 (US). This species may be one more extinction resulting from the conversion of the beautiful Pebbly Beach area (see photograph in Millsbaugh and Nuttall) to a commercial freight terminal.

LEPIDIUM NITIDUM Nutt. var. *NITIDUM*. Smooth Peppergrass. Frequent annual of dry, sunny places, on substrates varying from clay to sand dunes and rocky ledges, 15–1800 ft: Middle Ranch Canyon below Eagle’s Nest, Salta Verde, upper end W fork Gallagher’s Canyon, Echo Lake, SW slope of Mt. Orizaba, Rancho Escondido, Little Harbor, Isthmus, Parsons’ Landing.

**LEPIDIUM VIGINICUM* L. var. *PUBESCENS* (Greene) C. L. Hitchc. [*L. medium* Greene] Annual weed from the eastern United States found in two places: weed near golf links, Avalon, 100 ft, *Thorne* 36484, June 1, 1966; roadside in shade, Cherry Valley, 200 ft, *Thorne* 35955, Apr. 7, 1966.

**LOBULARIA MARITIMA* (L.) Desv. [*Konigia maritima* (L.) R. Br.] Sweet Alyssum. Mediterranean perennial escaped from gardens in several places: as Pebbly Beach, Descanso Canyon, White’s Landing.

**RAPHANUS RAPHANISTRUM* L. Wild Radish, White Charlock. Locally abundant Eurasian annual, weedy fields and disturbed ground, 300–750 ft: Avalon Valley, Middle Ranch Canyon above the ranch and near the dam.

**RAPHANUS SATIVUS* L. Radish. Widely cultivated biennial or annual of uncertain origin, locally abundant near dam at Middle Ranch and in Avalon Valley.

**RORIPPA NASTURTIUM-AQUATICUM* (L.) Schinz & Thell. [*Sisymbrium Nasturtium-aquaticum* L., *Nasturtium officinale* R. Br.] Water Cress. Eurasian-North African aquatic perennial frequent and abundantly established in permanent, running water in canyons of the SE half of island: Hay Press, Bulrush, Middle Ranch, Cape, Fern, and Cottonwood Canyons.

SIBARA FILIFOLIA (Greene) Greene. Believed to be restricted to Santa Cruz Island, this slender annual was formerly, at least, also present on Catalina: “common in two localities,” *Trask*, Mar. 1901 (LAM).

**SISYMBRIUM ALTISSIMUM* L. [*Norta altissima* (L.) Britt.] Tumble Mustard. Eurasian annual weed found at two places: margin of Wrigley Reservoir, 400 m, *Fosberg* S4854, May 12, 1931 (LAM); Cape Canyon roadside, 220 m, *Fosberg* S5385, July 11, 1931 (LAM).

**SISYMBRIUM IRIO* L. London Rocket. Mediterranean annual weed abundantly established at the Isthmus and observed also at White’s Landing.

**SISYMBRIUM OFFICINALE* (L.) Scop. Another Eurasian-North African weedy annual collected in Middle Ranch Canyon below Eagle’s Nest, 180 m, *Fosberg* S4665, Apr. 16, 1931 (LAM) and observed in Swain’s Canyon June 2, 1966.

**SISYMBRIUM ORIENTALE* L. Of similar origin, this weedy annual is established in lower Pebbly Beach Canyon, 250 ft, *Thorne* 33462, Feb. 7, 1964, and on the beach at White’s Landing, 5 ft, *Thorne* 35896, Apr. 6, 1966.

THELYPODIUM LASIOPHYLLUM (H. & A.) Greene var. *LASIOPHYLLUM*. Infrequent annual of sunny, grassy or rocky slopes or shaded, wooded bottoms of canyons of SE half of island, 75–1350 ft: Pebbly Beach, Avalon, Gallagher’s, and Bulrush Canyons.

THYSANOCARPUS CURVIPES Hook. var. *ELEGANS* (F. & M.) Rob. in A. Gray. Rare annual found once on shaded, grassy slope under *Quercus dumosa* above lower end of Bulrush Canyon, 800 ft, *Thorne and Rollins* 36748, Mar. 18, 1967.

THYSANOCARPUS LACINIATUS Nutt. ex T. & G. Lace-pod. Frequent annual of shaded or grassy canyon slopes and bottoms, SE half of island, 200–1350 ft: Pebbly Beach, Hamilton, Gallagher’s, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons.

TROPIDOCARPUM GRACILE Hook. Very rare annual, not recently collected: "common in alpine meadows," *Trask*, March 1900 (LAM).

CACTACEAE

BERGEROCACTUS EMORYI (Engelm.) Britt. & Rose [*Cereus emoryi* Engelm.] Picturesque columnar cactus with erect or pendulous stems, limited on Catalina to Pacific sea-bluffs between Salta Verde and Catalina Harbor: abundant over many acres on the slopes of Indian Head Point with *Opuntia prolifera* and *O. littoralis*, up to 200 ft elev., *Thorne and Everett* 35050, June 24, 1965; but only a few clumps on the S shore of Catalina Harbor E of Ballast Point. Until relationships within *Cereus* are better understood, I prefer to emphasize the distinctness of this cactus by accepting Britton and Rose's treatment.

**OPUNTIA FICUS-INDICA* (L.) Mill. [incl. *O. megacantha* Salm-Dyck] Yellow Tuna, Mission Cactus. Both spine-less and spiny-jointed forms have been seen by D. Walkington (pers. comm.) as escaped plants on the dry slopes and ridges in the Avalon vicinity. Lyman Benson (pers. comm.) has studied a specimen of the spiny form from Descanso Canyon, *Millspaugh* 4523 (F).

The native low-spreading or prostrate, highly variable prickly-pears that abound over the whole island have been recognized as several different species. Their patterns of variation are so complex and hybridization among them and perhaps with the introduced Mission Cactus so rampant that it is most difficult to catalogue the prickly-pear taxa. The reader is referred to Philbrick (1964), Walkington (1965), and Benson and Walkington (1965) to understand better the attempted listings here.

OPUNTIA "DEMISSA Griffiths." Prickly Pear, Tuna. [*O. occidentalis* of Millsp. & Nutt. in part] This taxon, Walkington's Type I, is believed by him to be of possible hybrid origin and to show characteristics of his Types C (probably a form of *O. ficus-indica* much introgressed by native species), D ("a plant similar to the transmontane *O. phaeacantha* var. *discata*"), and G ("a form close to the native *O. littoralis* var. *astrocalifornica*"). He collected it in Descanso Canyon NW of Avalon, 200 ft on an ENE-facing slope in rocky grazed chaparral, *Walkington* 226, February 9, 1964. I have seen the following: sand flat at Little Harbor, 3 m, *Fosberg* S4892, May 18, 1931 (POM); hills, N face Swain's Canyon, 1000 ft, *J. Lanjouu and R. Benson* 15103, May 2, 1953 (POM). Lyman Benson has also studied a specimen of *Millspaugh's* from the island (F). Certainly a high percentage of the prickly-pears on Catalina must be assigned to this hybrid swarm.

OPUNTIA LITTORALIS (Engelm.) Cockerell var. *LITTORALIS*. [*O. occidentalis* of Millsp. & Nutt. in part] Common over island on dry, rocky slopes and ridges, but for obvious and painful reasons it is seldom collected. Lyman Benson has studied *Millspaugh's* 4525 from Descanso Canyon (F), and Walkington has collected a specimen he determined as var. *vaseyi* (Coul.) Bens. & Walk.: between Hamilton and Cherry Canyons, 350 ft, on crest of hill among low-growing grazed, scrubby chaparral, *Walkington* 231, Feb. 9, 1964.

OPUNTIA ORICOLA Philbrick. [prob. *O. occidentalis* of Millsp. & Nutt. in part] Ralph N. Philbrick (pers. comm.) estimates that the prickly-pear population over the western end of the island may consist of 30% *O. littoralis*, 30% *O. oricola*, and 30% intermediates between these two. During my field work on the island, I was too unfamiliar with the prickly-pears to dispute these figures though the *O. oricola* seemed to me much less in evidence than the *O. littoralis* and intermediates. Lyman Benson has studied a collection of this species from Little Harbor, *Fosberg* S4892 (PH, UC).

OPUNTIA PHAEACANTHA Engelm. var. *DISCATA* (Griffiths) Bens. & Walk. This taxon is usually regarded as an inland desert prickly-pear, but Walkington regards his Type G as very similar to it. He collected this, or at least his Type G, in Hamilton Canyon near the boat landing, 100 ft, on E-facing slope in grazed rocky chaparral, *Walkington* 230, Feb. 9, 1964.

OPUNTIA PROLIFERA Engelm. Cholla. This erect cactus, with terete stem joints that readily break away from the plant and with proliferating fruit, is apparently restricted to the Pacific slope between Middle Ranch Canyon-Cottonwood Canyon ridge and Catalina Harbor: rocky SW-facing slopes on ridge, Indian Head Point, 200 ft, *Thorne and Everett* 35049, June 24, 1965. Lyman Benson has also studied specimens from: ridge between Middle Ranch and Cottonwood Canyons, *Nuttall* 764, Aug. 4, 1920 (F); opposite Ballast Point, Catalina Harbor, *E. C. Knopf*, May 28, 1892 (US).

CAMPANULACEAE

TRIODANIS BIFLORA (Ruiz. & Pav.) Greene [*Specularia biflora* (R. & P.) F. & M.] Venus's Looking-glass. Infrequent annual on shaded slopes and bottoms of canyons on SE half of island, 200–1400 ft: Pebbly Beach, Gallagher's, Cape, Bulrush, and Fern Canyons, and S slope of Mt. Orizaba.

CAPPARIDACEAE

CLEOME ISOMERIS Greene. [*Isomeris arborea* Nutt. in T. & G.] Bladder-pod. Common shrub, apparently in bloom all year, on dry, rocky sea-bluffs along coast, less common inland on dry, sunny, clayey or rocky canyon slopes, 5–500 ft: Palisades near Jewfish Point, Lookout Point, Avalon Bay, White's Landing, below Eagle's Nest, Ben Weston Beach, Cottonwood Canyon above dam, above Empire Landing, Isthmus, above Emerald Bay, Parsons' Landing.

CAPRIFOLIACEAE

LONICERA HISPIDULA Dougl. var. VACILLANS Gray [*L. catalinensis* Millsp.] Wild Honey-suckle. Common climbing shrub or liana on SE half of island in canyon bottoms and slopes, especially abundant along streams, sometimes forming dense tangles with *Clematis* and *Toxicodendron*, 100–1400 ft: Pebbly Beach, Avalon, Hay Press, Gallagher's, Swain's, Middle Ranch, and Bulrush Canyons.

LONICERA SUBSPICATA H. & A. var. JOHNSTONII Keck. Straggling shrub collected only once: "growing through tangle of shrubbery in draw S of Camp Orizaba, mouth of Swain Canyon, E slope of Catalina Island," K. K. Muller 588, May 2, 1953 (SBBG).

SAMBUCUS MEXICANA Presl. [*S. caerulea* of Millsp. & Nutt.] Elderberry. Common large shrub or small tree in canyons over the island, 20–1400 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, and Bulrush Canyons, old quarry above Empire Landing, Howland's Landing. I have observed trees to 20 or 25 ft. Raven (1963) described his collection from San Clemente Island "from a tree about 6 m tall and 7 m across, the trunk nearly 1 m in diameter." He suggests that *S. mexicana* may not be specifically distinct from *S. caerulea* Raf. Possibly the two taxa would be better treated as subspecies.

SYMPHORICARPOS MOLLIS Nutt. in T. & G. Snowberry. Frequent low shrub in semi-shade of canyon bottoms and slopes on SE half of island, 100–1400 ft: Pebbly Beach, Hamilton, Gallagher's, Toyon, Cape, Middle Ranch, and Bulrush Canyons, and SW slope of Mt. Orizaba.

CARYOPHYLLACEAE

ARENARIA DOUGLASII Fenzl. ex T. & G. Sandwort. Rare annual of sunny, dry, rocky places: steep S wall of Eagle's Nest, Middle Ranch Canyon, 180 m, Fosberg S4721, Apr. 29, 1931; along bare rocky ridge running SW from Mt. Orizaba, 1900 ft, Thorne 36425, May 31, 1966.

*CERASTIUM GLOMERATUM Thuill. [*C. viscosum* of authors] Mouse-ear Chickweed. Frequent, probably actually common, annual Eurasian weed of grassy slopes, dry stream beds and banks, and shaded canyon bottoms, 25–800 ft: Pebbly Beach, Gallagher's, Toyon, Fern, and Bulrush Canyons, Moonstone Cove, Isthmus, Cherry Valley.

POLYCARPON DEPRESSUM Nutt. Rare annual, not recently collected: "one canyon, not frequent," Trask, June 1897 (US); Santa Catalina Island, G. B. Grant 1023, June 1901 (US).

*POLYCARPON TETRAPHYLLUM (L.) L. European annual weed known only from *Prunus ilicifolia lyonii* grove near mouth of Cherry Valley, 200 ft, Raven 17827, May 22, 1962.

SAGINA OCCIDENTALIS Wats. Pearlwort. Rare annual of sandy stream beds, not recently collected: "rare, water courses," Trask, April 1898 (US); "rare in sandy soil," Trask, Feb. 1898 (US); dry stream bed, mouth of Hamilton Canyon, 2 m, Fosberg S4331, March 23, 1931 (LAM).

SILENE ANTIRRHINA L. Sleepy Catchfly. Rare annual of dry, rocky slopes and talus, 150–850 ft: upper end of Pebbly Beach Canyon, 850 ft, Thorne 36231, April 28, 1966; sea bluffs W of Hamilton Canyon, 50 m, Fosberg S4381, March 26, 1931 (LAM); Cherry Valley, 200 ft, Thorne 35941, April 7, 1966.

*SILENE GALLICA L. Common European annual weed over island on dry, sunny, grassy, rocky, or clayey slopes, 20–1600 ft: Pebbly Beach, Avalon, Middle Ranch, and Bulrush Canyons, Salta Verde, White's Landing, S slope Mt. Orizaba, Isthmus, Parsons' Landing.

SILENE MULTINERVIA Wats. Very rare native annual, not recently collected: "few individuals," *Trask*, March 1900 (US).

**SPERGULARIA ARVENSIS* L. Corn Spurrey. European annual weed found only in disturbed ground near dam, Middle Ranch, 650 ft, *Thorne* 36292, Apr. 29, 1966.

**SPERGULARIA BOCCONII* (Scheele) Aschers. & Graebn. Sand Spurrey. Common Eurasian-North African annual of beach flats, salinas, stream beds, reservoir margins, and disturbed, grassy places, 10-1600 ft: Pebbly Beach Canyon, Ben Weston Beach, Echo Lake, NW slope Black Jack Mt., margin of lower Buffalo Springs Reservoir, Catalina Harbor, Emerald Bay, Howland's Landing.

SPERGULARIA MACROTHECA (Hornem.) Heynh. var. *MACROTHECA* [*Tissa macrotheca* (Hornem.) Britt.] Frequent, rather succulent perennial of salinas, beach flats, and bases of beach bluffs, 10-25 ft: Pebbly Beach, Ben Weston Beach, Little and Shark Harbors, Isthmus, Emerald Bay, Parsons' Landing.

SPERGULARIA MARINA (L.) Griseb. [*Tissa salina* (Presl) Britt.] Sea Spurrey. Rare, rather succulent annual of saline flats near sea level: salt flat N of Catalina Harbor at Isthmus, *Thorne* 34539 and 34540, May 11, 1965: tip of Ballast Point, Isthmus, *Thorne* 35768, Apr. 4, 1966.

SPERGULARIA VILLOSA (Pers.) Camb. [*Tissa Clevelandi* Greene] Rare prostrate perennial of temporary pools and stream margins, 175-1400 ft: Toyon Picnic Ground, upper end Gallagher's Canyon, and lower Middle Ranch Canyon above Ben Weston Beach.

**STELLARIA MEDIA* (L.) Vill. [*Alsine media* L.] Chickweed. Common Eurasian annual weed of shaded canyon slopes and bottoms over island, 25-1600 ft: Pebbly Beach, Avalon, Gallagher's, Bulrush, and Cottonwood Canyons, S slope Mt. Orizaba, Cherry Valley, Parsons' Landing.

STELLARIA NITENS Nutt. [*Alsine nitens* (Nutt.) Greene] Rare, inconspicuous annual, not recently collected: "common on moist flats," *Trask*, March 1901 (US); and "rare," *Trask*, May 1898 (US).

CHENOPODIACEAE

APHANISMA BLITOIDES Nutt. ex Moq. Rare annual found only on rocky bluffs at the E side of Catalina Harbor, 150 ft, *Thorne* 34528, May 11, 1965.

ATRIplex ARGENTEA Nutt. subsp. *EXPANSA* (Wats.) Hall & Clem. Saltbush. Rare annual collected at the Isthmus on a gravelly beach above the littoral zone, 1-3 m, *Fosberg* S5422 and S5423, July 15, 1931 (POM, LAM).

ATRIplex CALIFORNICA Moq. in DC. Frequent prostrate perennial of sandy beaches, salinas, and beach flats, rocky sea-bluffs, stream margins, and clayey slopes of the Pacific slope and NW end of island, 5-350 ft: Ben Weston Beach, lower parts of Cottonwood Creek, slopes between and at Middle Ranch Canyon and Little Harbor, Isthmus Harbor, Emerald Bay.

ATRIplex COULTERI (Moq.) D. Dietr. Frequent low perennial or annual of bare, dry, clayey or rocky ridges and reservoir margins of the Pacific slope, 65-1350 ft: Pacific Divide, Bulrush Ridge, Hay Press Reservoir, Eagle's Nest, Cottonwood Canyon, Isthmus.

ATRIplex LENTIFORMIS (Torr.) S. Wats. subsp. *BREWERI* (S. Wats.) Hall & Clem. [*A. Breweri* S. Wats.] Very rare erect shrub, not recently collected: "one plant 8 feet tall overhanging sea," *Trask*, June 1897 and 1898 (US). Reported by Millsbaugh and Nuttall also from E end Johnson's Beach on sandy tide flat.

ATRIplex LEUCOPHYLLA (Moq.) D. Dietr. Frequent sprawling perennial of sandy beaches and dunes about island, 2-10 ft: Moonstone Cove, White's Landing, Ben Weston Beach, Shark and Little Harbors, Catalina Harbor, Parsons' Landing.

ATRIplex PACIFICA A. Nels. Rare prostrate annual of dry, open slopes: "common on arid slopes," *Trask*, Mar. 1901 (LAM); Middle Ranch Canyon, dry N wall, 200 m, *Fosberg* S4684, Apr. 22, 1931 (LAM); Middle Ranch Canyon, dry open places, *F. W. Johnson*, Mar. 29, 1950 (US).

**ATRIplex PATULA* L. var. *HASTATA* (L.) A. Gray. Rare but locally abundant Eurasian annual of sandy, saline flats behind beaches along Pacific shore, 5-25 ft: Ben Weston Beach, Shark Harbor, Little Harbor. This hastate-leaved form of *A. patula* seems to lack ecological

or geographic significance, hence hardly merits subspecific ranking.

**ATRIPLEX ROSEA* L. Redscale. Eurasian annual weed collected once at Avalon: near cottage, 20 ft, *R. L. Pendleton* 1381, July 2, 1909.

**ATRIPLEX SEMIBACCATA* R. Br. Australian Saltbush. Abundant spreading Australian perennial over island on beaches, salinas, sea-bluffs, and dry, grassy, rocky, or clayey slopes inland, 6-1500 ft: Lookout Point, Hay Press area, Middle Ranch, Ben Weston Beach, Little Harbor, White's Landing, above Empire Landing, Isthmus, Parsons' Landing.

ATRIPLEX SERENANA A. Nels. var. *DAVIDSONII* (Standl.) Munz. Apparently very rare coarse annual collected by Alice Eastwood on the island and without definite locality, July 20-25, 1917 (US). Reported by Millsbaugh and Nuttall also from Pebbly Beach.

ATRIPLEX WATSONII A. Nels. Rare prostrate, mat-forming, suffrutescent perennial found only along Catalina Harbor at the Isthmus: pebbly spit of Ballast Point above littoral zone, 1 m, *Fosberg* S4925, May 20, 1931; small salina within base of Ballast Point, *Thorne* 36690, Sept. 15, 1966; salt flat north of Catalina Harbor, *Thorne* 34546, May 11, 1965.

**BASSIA HYSSOPIFOLIA* (Pall.) Kuntze. Eurasian annual weed found at two locations: roadside near high school, Avalon, 100 ft, *Thorne* 36193, Apr. 28, 1966; weedy bottom of old quarry W of Empire Landing, 250 ft, *Thorne* 35922, Apr. 6, 1966.

**BETA VULGARIS* L. subsp. *MARITIMA* (L.) Thell. Beet. Rare but locally abundant Eurasian biennial in saline, open situations along the Pacific coast, 10-400 ft: sand flat behind Ben Weston Beach, 10 ft, *Thorne* 34953, June 23, 1965; Catalina Harbor, 10 ft, *Wolf* 3579, May 12, 1932, and *Thorne* 34538, May 11, 1965; and observed at Indian Head Point, June 5, 1966.

**CHENOPODIUM AMBROSIODES* L. Mexican-tea. Tropical American weedy annual found at two locations: sandy, disturbed area behind Ben Weston Beach, 10 ft, *Thorne* 36645, Sept. 14, 1966; small desiccated marshes above Parsons' Landing, 250 ft, *Thorne* 36680, Sept. 15, 1966.

**CHENOPODIUM BERLANDIERI* Moq. subsp. *ZSCHAKEI* (Murr.) Zobel. [prob. *C. album* of Millsp. & Nutt.] Goosefoot. Infrequent weedy annual, native to interior North America, of cultivated and other disturbed ground, 10-600 ft: White's Landing, Middle Ranch, Ben Weston Beach, Bird Rock.

CHENOPODIUM CALIFORNICUM (S. Wats.) S. Wats. Soap Plant. Common perennial over island on shaded canyon bottoms and slopes, 60-1600 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, and Bulrush Canyons, SW slope Mt. Orizaba, quarry above Empire Landing, Cherry Valley, and Parsons' Landing.

**CHENOPODIUM MURALE* L. Goosefoot. Common European annual weed over island in disturbed ground and shaded places, 10-1600 ft: Pebbly Beach Canyon, Avalon, White's Landing, SW slope Mt. Orizaba, Ben Weston Beach, Catalina Harbor, Emerald Bay.

SALICORNIA SUBTERMINALIS Parish [*Arthrocnemum subterminale* (Parish) Standl.] Samphire, Glasswort. Rare but locally abundant suffrutescent perennial of salinas and bases of rocky beach bluffs of Pacific shore, 3-10 ft: Shark and Little Harbors and salina within the base of Ballast Point in Catalina Harbor at the Isthmus.

SALICORNIA VIRGINICA L. Rare but locally abundant perennial with the preceding species in salinas at Little Harbor and Ballast Point, Catalina Harbor.

**SALSOLA PESTIFERA* A. Nels. [*S. kali* L. subsp. *ruthenica* (Iljin) Soo, *S. kali* L. var. *tenuifolia* Tausch.] Russian-thistle. Eurasian weedy annual collected once at mouth of draw on beach, Isthmus Harbor, 1 m, *Fosberg* S4967, May 1931 (LAM).

SUAEDA CALIFORNICA S. Wats. [*Dondia californica* (S. Wats.) Heller, *D. taxifolia* Standl.] Sea-blite. Infrequent suffrutescent perennial of Pacific shore on beaches, dunes, salinas, mud flats, and other saline situations, 3-15 ft: Ben Weston Beach, Shark, Little, and Catalina Harbors. Most of our material is the pubescent form, sometimes recognized as a distinct species or variety.

CISTACEAE

HELIANTHEMUM GREENEI Robins. Rock-rose. Rare perennial island endemic known on Santa Catalina only from the eastern slope of Black Jack Mt. and elsewhere only from Santa Cruz and San Miguel Islands: under *Arctostaphylos* in rocky clay soil in open chaparral,

1200 ft, NE side Black Jack Mt. at junction of Island Road and White's Landing Road, *Blakley* 5433, Oct. 5, 1962 (SBBG) and *Blakley* 5580, Apr. 10, 1963 (SBBG); dry open slope near grove of *Lyonothamnus*, about 1250 ft, E slope Black Jack Mt., *Thorne and Carlquist* 36316, Apr. 29, 1966. (Fig. 21).

An apparent hybrid between this and the following species was found growing with its two putative parent species and was intermediate between the two in appearance as well as in position: *Thorne and Carlquist* 36314, Apr. 29, 1966. (Fig. 21).

HELIANTHEMUM SCOPARIUM Nutt. var. *VULGARE* Jeps. [*Crocanthemum scoparium* (Nutt.) Millsp.] Infrequent suffrutescent perennial of high, central portion of island in chaparral or on open, dry, rocky or eroded, clayey slopes, 1000–2000 ft: SE of summit of Equestrian Trail back of Avalon, Hay Press area, E slope Black Jack Mt., and “dry slopes at 2000 feet,” *Trask*, Mar. 1900 (US). (Fig. 21).

CONVOLVULACEAE

CALYSTEGIA MACROSTEGIA (Greene) Brummitt [*Convolvulus californicus*, *C. occidentalis*, and *C. sepium* of Millsp. & Nutt.] Bindweed. Common twining perennial over island climbing over or twining through chaparral, coastal sage scrub, and prickly-pear in dry, sunny locations, 50–1600 ft: Pebbly Beach, Avalon, Swain's, Middle Ranch, and Bulrush Canyons, slopes of Black Jack Mt., Isthmus. The specimens studied seem to fall in rather equal numbers into subsp. *macrostegia*, subsp. *cyclostegia* (House) Brummitt, and subsp. *intermedium* (Abrams) Brummitt.

CALYSTEGIA SOLDANELLA (L.) R. Br. [*Convolvulus Soldanella* L.] Seaside Morning-glory. Apparently absent now from the island's beaches, for diligent search failed to turn up a single plant of this prostrate perennial of dunes despite early records of the species from Catalina by Lyon (1886), Brandegee (1890), and Eastwood (1941).

**CONVOLVULUS ARVENSIS* L. Bindweed. Sprawling Eurasian perennial apparently established only in the Cape Canyon-Middle Ranch area on cultivated or otherwise disturbed ground: near dam at Middle Ranch, 650 ft, *Fosberg* S4745, May 2, 1931, and *Thorne* 36283, Apr. 29, 1966; orchard, Middle Ranch Canyon, 650 ft, *Dunkle* 1947, May 13, 1928; near Cape Canyon reservoir, 1100 ft, *Thorne* 36505, June 1, 1966.

CRESSA TRUXILLENIS HBK. var. *VALLICOLA* (Heller) Munz. Alkali Weed. Infrequent perennial of sandy or gravelly beaches, dunes, salinas, and other saline locations along the coast: Avalon, Shark, Little, and Catalina Harbors, Howland's and Parsons' Landings.

CUSCUTA OCCIDENTALIS Millsp. Dodder. Infrequent parasite, usually on *Salvia mellifera* in coastal sage scrub, 100–1350 ft: golf links, Avalon, *Nuttall* 272, May 26, 1920 (F); N wall Hamilton Canyon, 50 m, *Fosberg* S4405, Mar. 27, 1931 (LAM); Black Jack Mt., 1400 ft, *Nuttall* 902, Sept. 21, 1920 (F); eroded, clayey dry hillside on E slope of Black Jack Mt., *Thorne* 36310, Apr. 29, 1966, and 36510, June 2, 1966; Salta Verde, *Thorne* 36869, May 18, 1967; Sweetwater Canyon ridge above Middle Ranch, *Thorne* 36881, May 19, 1967.

DICHONDRA OCCIDENTALIS House. Infrequent creeping perennial herb on dry open or grassy, semi-shaded slopes, 50–1000 ft: Avalon area, Moonstone Cove, E slope Black Jack Mt., near head of Swain's Canyon, Cottonwood Canyon, Salta Verde.

**IPOMOEA HEDERACEA* Jacq. Morning-Glory. Twining annual, not recently seen but reported by Millspaugh and Nuttall (1923) as “plentifully escaped from gardens and fully established in canyons. January to December. Vicinity of Avalon . . . and in Cherry Valley, at Howland's and Johnson's Landings”: waste grounds, plentifully established, Avalon, *Millspaugh* 4541, Jan. 5, 1920 (F).

CORNACEAE

CORNUS GLABRATA Benth. [*Svida catalinensis* Millsp.] Very rare shrub, not recently collected on Catalina. We were unable to find the one shrub in Hamilton Canyon from which apparently all specimens examined had been taken. The latest specimens from that plant are: canyon floor, creek bed, 60 m, “probably same plant as type of *Svida catalinensis* Millsp.” [*Knopf* 126 (F)] *Fosberg* S4679, Apr. 24, 1931, and S5395, July 13, 1931 (LAM); left fork, 200 ft above forks, small tree 20 ft high and spread, 1 limb 6 in., seven others smaller, 400 ft,

Wolf 3617, May 13, 1932. Trask collected from "one tree, 15 ft tall, drooping branches," June 1901 (US).

CRASSULACEAE

CRASSULA ERECTA (H. & A.) Berger [*Tillaea erecta* H. & A.] Infrequent, very small tufted annual on dry, open, sandy or clayey slopes scattered over island, 6–350 ft: Hamilton, Rock Spring, and Cottonwood Canyons, quarry above Empire Landing, Parsons' Landing.

DUDLEYA GREENEI Rose. This island endemic, a rosette perennial, apparently has been collected only once near Little Harbor on the Pacific shore: paralleling road to Isthmus, $\frac{1}{4}$ mile from Little Harbor, *Wolf* 3588 *in part*, Apr. 28, 1950 (RSA 1491 *in part*), $n=34$ (CAS). Known otherwise only from Santa Cruz, Santa Rosa, and San Miguel Islands.

DUDLEYA HASSEI (Rose) Moran [*Stylophyllum Hassei* Rose] Rosette perennial frequent on sea-bluffs and dry, rocky slopes mostly near Channel shore, 15–200 ft: Lookout Point, along Pebbly Beach Drive, Hamilton Beach, mouth of Gallagher's Canyon, White's Landing, Indian Head Point. An insular endemic apparently restricted to this island and Guadalupe Island.

DUDLEYA VIRENS (Rose) Moran [*Stylophyllum insulare* Rose] Infrequent rosette perennial mostly of the Pacific slope on sea-bluffs and rocky headlands, less frequent inland on dry, rocky slopes, 15–900 ft: Middle Ranch Canyon, Indian Head Point, Shark and Little Harbors, White's Landing. Known otherwise only from San Clemente and San Nicolas Islands and Point San Vicente on the adjacent mainland.

CROSSOSOMATACEAE

CROSSOSOMA CALIFORNICUM Nutt. Wild-apple. Common large shrub, mostly in chaparral or coastal sage scrub, over island on rocky sea-bluffs, wooded canyons, and dry, open, sunny slopes on rocky clay, 15–1600 ft: East Peak, Renton Mine, Lookout Point, Avalon Valley, White's Landing, E slope Black Jack Mt., Middle Ranch Canyon, Indian Head Point, Isthmus, Fourth of July Cove. This relict island endemic is known otherwise only from San Clemente (rare) and Guadalupe Islands. (Fig. 20).

CUCURBITACEAE

MARAH MACROCARPUS (Greene) Greene [*Micrampelis macrocarpa* Greene] Big Root, Wild Cucumber. Common climbing or trailing, monoecious, perennial vine in chaparral, oak woodland, shaded canyon bottoms and slopes, or sunny, rocky, or clayey hillsides over island, 15–900 ft: Lookout Point, Renton Mine, Avalon, Eagle's Nest, White's Landing, above Empire Landing, Isthmus, Cherry Valley, Howland's and Parsons' Landing.

ELATINACEAE

ELATINE CALIFORNICA Gray. Waterwort. Rare aquatic annual found only once on wet mud and in very shallow water at margin of lower Buffalo Springs Reservoir, N of the Catalina Airport, 1430 ft, *Thorne* 35898, Apr. 6, 1966.

ERICACEAE

ARCTOSTAPHYLOS SUBCORDATA Eastw. *vel af.* [*Uva-ursi tomentosa* of Millsp. & Nutt.] Manzanita. Infrequent chaparral shrub or small tree on the uplands of central part of island, 900–1500 ft: Hay Press area, upper end Gallagher's Canyon, ridge S of Bulrush Canyon, E slope Black Jack Mt., Swain's Canyon. I have observed trees of this species to 1 ft DBH and 15 ft tall. Santa Catalina material of this manzanita has masqueraded under many names, as *A. tomentosa*, *A. glandulosa mollis*, and *A. pechoensis viridissima*, and its relationship to *A. subcordata*, otherwise believed restricted to Santa Cruz and Santa Rosa Islands, has generally been overlooked because of the apparent absence of a basal burl.

COMAROSTAPHYLIS DIVERSIFOLIA (Perry) Greene var. *PLANIFOLIA* Jeps. [incl. *C. polifolia* of Millsp. & Nutt.] Summer-holly. Infrequent large shrub or small tree (some specimens with trunks to 1 ft DBH and 20–30 ft tall) on upper slopes of Mt. Orizaba and Black Jack Mt. in central part of island, forming open woodland with oaks, toyon, and cherry, 900–1600 ft: Swain's Canyon, *Jepson* 3064 (JEPS); steep N slope, Orizaba Canyon, *Dunkle* 1712, Mar. 4, 1928 (POM, LAM); W slope Mt. Orizaba near upper end Escondido C., 900 ft, *Thorne* 35032,

June 24, 1965; ridge running SW from Mt. Orizaba, S side S fork of Fern Canyon, 1600 ft, *Thorne* 36419, May 31, 1966, upper Sweetwater Canyon, *Thorne* 36888, May 29, 1967. (Fig. 25).

XYLOCOCCUS BICOLOR Nutt. Infrequent chaparral shrub of NW third of island beyond Isthmus, 60–1100 ft: Fourth of July Cove, Cherry Valley, between Cherry Valley and Howland's Landing, ridge above Johnson's Landing.

EUPHORBIACEAE

EREMOCARPUS SETIGERUS (Hook.) Benth. Turkey-mullein. Infrequent spreading annual of dry, sunny, grassy slopes, sandy stream beds, eroded, rocky clay hilltops, and other disturbed ground of SE half of island, 10–1600 ft: near Wrigley Reservoir, Middle Ranch, Ben Weston Beach, Swain's Canyon, SW slope Mt. Orizaba, Cape Canyon.

EUPHORBIA CRENULATA Engelm. [*Tithymalus leptocerus* (Engelm.) Millsp.] Spurge. Rare annual or biennial, not recently collected on Catalina. None of the sheets examined were collected after 1920, and all are from the SE third of the island: "rare, moist slopes of canyons," *Trask*, May 1896 (US); Avalon Run, Avalon Canyon, 1000 ft, *Nuttall* 170, May 10, 1920 (F, CAS); top of ridge at left of Big Wash Canyon, *Nuttall* 236, May 19, 1920 (F); behind large rocks in bed of deep channel, Gallagher's Canyon, *Millspaugh* 4867, Mar. 25, 1920 (F).

EUPHORBIA MISERA Benth. [*Trichostigma miserum* (Benth.) Kl. & Gke.] Because the rocky shore between Lookout Point and Seal Rocks, from which this straggling shrub was known, has largely been blasted away in quarrying operations, it is rather unlikely that this spurge is still part of the Santa Catalina flora: "Two localities, sea cliffs, few plants, spreading, 1–1.5 ft," *Trask*, Mar. 1900 (US).

**EUPHORBIA PEPLUS* L. This Eurasian-North African weedy annual is established in the Avalon area and at Middle Ranch, 25–700 ft.

EUPHORBIA SERPYLLIFOLIA Pers. [*Chamaesyce serpyllifolia* (Pers.) Small] Ground Spurge. Rare prostrate weedy annual of roadsides, reservoir margins, and disturbed ground generally, 10–1000 ft: Reservoir No. 2 in upper Middle Ranch Canyon, 1000 ft, *Thorne* 34964, June 23, 1965; road between Eagle's Nest and Sweetwater Canyon, *Fosberg* S4912, May 18, 1931; behind Ben Weston Beach, 10 ft, *Thorne* 36654, Sept. 14, 1966.

EUPHORBIA SPATHULATA Lam. [*Tithymalus dictyospermus* (F. & M.) Heller] Rare erect annual of the Channel slope on grassy hillsides and dry roadsides, 100–1300 ft: roadside at head of Swain's Canyon, 1300 ft, *Dunkle* 1958, May 13, 1928; Blue Cavern Point NE of Isthmus Cove, 100 ft, *Thorne* 35774, Apr. 4, 1966.

**RICINUS COMMUNIS* L. Castor Bean, Castor Oil Plant. This shrubby native of the Old World tropics is a rare but locally abundant escape from cultivation, mostly in open grassy canyon bottoms: behind Bird Park, Avalon, 300 ft, *Thorne* 34875, June 22, 1965; observed in Swain's Canyon, June 2, 1966.

FABACEAE (LEGUMINOSAE)

**ACACIA MELANOXYLON* R. Br. Wattle. This Australian tree seems to have established itself on the bluff above Pebbly Beach Drive SE of Avalon, as a shrubby escape, 150 ft, *Thorne* 36462, June 1, 1966.

ASTRAGALUS DIDYMOCARPUS H. & A. var. *DIDYMOCARPUS* [*Hesperastragalus didymocarpus* (H. & A.) Heller] Locoweed. Rare slender annual found at only two stations: dry, open clay slope at upper end Bulrush Canyon, 1000 ft, *Thorne* 34601, May 12, 1965; and grassy slopes above Gallagher's Canyon, E fork, 1400 ft, *Thorne* 36357, Apr. 30, 1966.

ASTRAGALUS GAMBELIANUS Sheldon [*Hesperastragalus Gambelianus* (Sheldon) Heller] Frequent slender annual of dry, rocky, bare or grassy slopes of SE half of island, 50–1100 ft: Pebbly Beach, Avalon, Descanso, Banning, Bulrush, and Cottonwood Canyons.

ASTRAGALUS LEUCOPSIS (T. & G.) Torrey. [*Phaca leucopsis* T. & G., *P. fastidia* (Greene) Kell] Rattle Weed. Common perennial over island on dry, sunny, clayey or rocky, bare or grassy slopes and ridges, often in coastal sage scrub, from sandy beach flats near sea level to the high slopes of Mt. Orizaba, 10–1600 ft: Avalon, Swain's, Middle Ranch, and Bulrush Canyons, Hay Press area, Salta Verde, slopes of Orizaba and Black Jack Mts., Little Harbor, above Empire Landing, Isthmus, Parsons' Landing.

ASTRAGALUS TRICHOPODUS (Nutt.) A. Gray [*Phaca trichopoda* Nutt. in T. & G.] Rare perennial, apparently restricted on Santa Catalina to rocky bluffs between Avalon and Pebbly Beach, from which taken by many collectors, but most recently by Wolf 3433, May 9, 1932, and Thorne 34871 and 34872, June 22, 1965.

***CORONILLA VALENTINA** L. Ornamental Mediterranean perennial collected once in sandy soil at bottom of small canyon 1 mi. S of Avalon on rocky ridge, few in shade, to 2 ft tall, Blakley 5607, Apr. 10, 1963 (SBBG).

***CYTISUS LINIFOLIUS** (L.) Lam. [*Genista linifolia* L.] Dyers' Greenwold. This attractive Canary Islands shrub has become abundantly established along roadsides on the SE half of the island, especially in the Avalon vicinity, 50–1200 ft: Wrigley Drive, Hamilton Canyon, Farnsworth Loop and generally along Summit Road, road from Airport to Rancho Escondido.

***CYTISUS MONSPESSULANUS** L. [*C. canariensis* of Millsp. & Nutt.] French Broom. A Mediterranean shrub established in the Avalon area, infrequent, 100–500 ft: Pebbly Beach Road, Hamilton Canyon Road, head of Avalon Valley, along Airport Road above gate W of Avalon.

LATHYRUS LAETIFLORUS Greene subsp. **ALEFELDII** (White) Brads. [*L. Alefeldi* White] Wild Sweet Pea. Frequent perennial vine climbing over or through chaparral, coastal sage scrub, oak woodland, and prickly-pear clumps or sprawling over dry, rocky clay slopes, mostly on Channel slope and central part of island, 50–900 ft: Pebbly Beach, Avalon, Gallagher's, Cape, and Middle Ranch Canyons, Moonstone Cove, Cherry Valley, and Howland's Landing. A variable taxon both in its foliage and its flowers, the latter being usually reddish purple but occasionally white.

***LATHYRUS TINGITANUS** L. Tangier Pea. Purple-flowered Eurasian annual well established on the bluffs along Pebbly Beach Road between Avalon and Lookout Point, 25–100 ft: G. A. Klein, May 1, 1941; Raven 17765, May 20, 1962; Thorne 34862, June 22, 1965, and 36461, June 1, 1966.

LOTUS ARGOPHYLLUS (A. Gray) Greene subsp. **ORNITHOPUS** (Greene) Raven [*Syrmatium ornithopum* Greene] Silvery-Clover. Perennial insular endemic common over island in coastal sage scrub and chaparral and on dry, open, sunny, rocky slopes, 25–1000 ft: Pebbly Beach, Avalon, Swain's, Cape, Middle Ranch, and Cottonwood Canyons, above Empire Landing, Isthmus, Cherry Valley. Elsewhere this subspecies is reported from San Nicolas, Santa Barbara, San Clemente, and Guadalupe Islands. The typical subsp. **ARGOPHYLLUS** has smaller flowers and is supposedly limited to the mainland, but a specimen matching its description was collected in Ironwood Gully, E side of Isthmus, on dry loam with grasses and *Opuntia*, by Piehl 62503 (SBBG).

***LOTUS CORNICULATUS** L. Bird's Foot Trefoil. Eurasian perennial collected once in lawn at Middle Ranch, 700 ft, Thorne 36700, Sept. 16, 1966.

LOTUS GRANDIFLORUS (Benth.) Greene [*Hosackia anthylloides* (Gray) Millsp.] Rare perennial collected twice: shrubby stream bottom, Johnson's Landing, 25 ft, Dunkle 1749, Mar. 17, 1928; N slope of Black Jack Mt. along Summit Road on shaly bank, 1400 ft, Thorne 35912, Apr. 6, 1966.

LOTUS HAMATUS Greene [*Syrmatium micranthum* (Nutt.) Greene] Common annual over island except for Pacific shore on dry, sunny, grassy or bare, rocky or clayey slopes and ridges, 200–1400 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Middle Ranch, Bulrush, and Cottonwood Canyons, Hay Press area, old quarry above Empire Landing, Isthmus, Cherry Valley, Parsons' Landing.

LOTUS HEERMANNII (Dur. & Hilg.) Greene. Mat-forming perennial, apparently very rare on the island for not recently collected, but cited by Otterley (1923) as var. **HEERMANNII** from Santa Catalina Island, G. B. Grant 716.

LOTUS HUMISTRATUS Greene [*Hosackia brachycarpa* Benth.] Another rare annual not recently collected: "rare, one locality, collected in a dry season," Trask, Apr. 1898 (US).

LOTUS PURSHIANUS (Benth.) Clem. & Clem. var. **PURSHIANUS** [*Hosackia americana* (Nutt.) Piper] Spanish-clover. Infrequent annual of higher, central portion of island on open flats, reservoir margins, and rocky bluffs, 25–1400 ft: Big Wash, Cape, and Gallagher's Canyons, Wrigley, Hay Press, and Cape Canyon reservoirs, White's Landing bluff.

LOTUS SALSUGINOSUS Greene [*Hosackia maritima* Nutt.] Frequent, rather succulent, prostrate annual over island on rocky sea-bluffs and talus and inland on dry, rocky slopes and

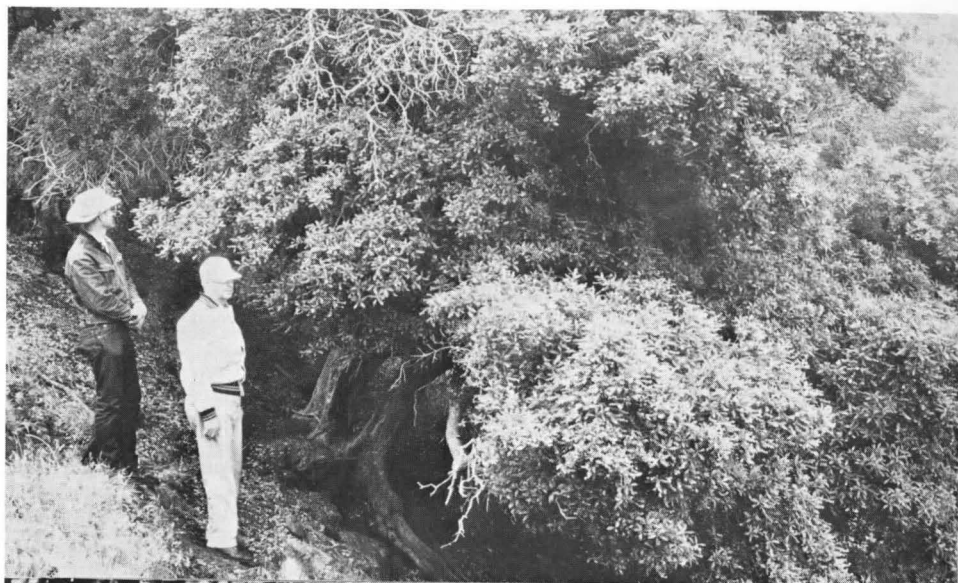


Fig. 25. Large specimens of Summer-Holly, *Comarostaphylis diversifolia planifolia*, on W slope of Mt. Orizaba at 900 ft, with Mr. Doug Propst (left) and Mr. Percy Everett (right). The trees are 20–30 ft tall and trunks each about 1 ft DBH.

Fig. 26. Exposed roots of Catalina Cherry, *Prunus ilicifolia lyonii*, on slopes of goat-infested Gallagher's Canyon, showing removal of soil cover due to over-grazing. Roots of Island Oak, *Quercus tomentella*, are similarly exposed here.

dry, sandy stream beds, 10–1000 ft: Renton Mine, Avalon Bay, Cottonwood Canyon, Ben Weston Beach, Little Harbor, Parsons' Landing.

LOTUS SCOPARIUS (Nutt. in T. & G.) Ottley subsp. *SCOPARIUS* [*Syrmatium glabrum* Vog., *S. dendroideum* Greene, and probably *S. Traskiae* of Millsp. & Nutt.] Deerbrush. Very common suffrutescent to shrubby perennial over island, except on Pacific shore, on dry, rocky slopes, ridges, and bluffs, often in coastal sage scrub or chaparral, 25–900 ft: Pebbly Beach, Avalon, Gallagher's, and Middle Ranch Canyons, above Empire Landing, Isthmus, Emerald Bay. As pointed out by Raven (1963), the Channel Island and adjacent mainland material of this species segregated out as var. *DENDROIDEUS* (Greene) Ottley intergrades so broadly with other mainland specimens that it does not seem wise to recognize them taxonomically at this time.

LOTUS STRIGOSUS (Nutt. in T. & G.) Greene [*Hosackia strigosa* Nutt. in T. & G., *H. rubella* Nutt. in T. & G.] Frequent annual over island on dry, rocky, open or grassy slopes and ridges, 50–800 ft: Renton Mine, Avalon, Hamilton, Bulrush, and Cottonwood Canyons, White's Landing, Cherry Valley, Emerald Bay.

LOTUS SUBPINNATUS Lag. [*Hosackia Wrangeliana* (F. & M.) G. Don] Infrequent annual of dry, sunny, rocky or grassy slopes and ridges of Channel slope, 15–375 ft: Bluffs between Pebbly Beach and Avalon Bay, Avalon Canyon, and ridge between White's Landing and Moonstone Cove.

LUPINUS ALBIFRONS Benth. var. *ALBIFRONS* [*L. hallii* of Millsp. & Nutt.] Lupine. Frequent shrub of Channel slope from Pebbly Beach to E slope of Black Jack Mt. on dry, sunny, rocky clay or grassy slopes, often with coastal sage scrub or chaparral, 150–1250 ft: Wrigley Drive above Pebbly Beach, Avalon, Descanso, and Hamilton Canyons, Summit Road to Farnsworth Loop, Summit Road above Swain's Canyon, N branch.

LUPINUS BICOLOR Lindl. subsp. *MICROPHYLLUS* (S. Wats.) D. Dunn [*L. micranthus* of Millsp. & Nutt.] Common slender annual over island on open, grassy slopes, mostly on clay or rocky clay soils, 300–1430 ft: ridge from Mt. Shatto back of Avalon, Hamilton, Gallagher's, Middle Ranch, and Bulrush Canyons, Hay Press area, near Buffalo Springs Reservoirs, Johnson's Landing. At least one specimen has been assigned by D. Dunn to the subsp. *UMBELLATUS* (Greene) D. Dunn: grassy open slopes at Parsons' Landing, 200 ft, *Dunkle 1741*, Mar. 17, 1928.

LUPINUS CONCINNUS J. G. Agardh [incl. *L. gracilis* of Millsp. & Nutt.] Frequent small villous-annual over island on dry, rocky or eroded, clayey slopes and ridges, 50–1600 ft: Pebbly Beach, Avalon, Hamilton, Gallagher's, and Cottonwood Canyons, Hay Press area, slopes of Black Jack Mt., Moonstone Cove, Little Harbor, Cherry Valley. Plants referable to several named varieties are present in this variable island population.

LUPINUS HIRSUSSIMUS Benth. Stinging Lupine. Frequent robust annual with nettle-like hairs on dry, rocky inland hillsides and coastal sea-bluffs, 15–800 ft: Renton Mine, Avalon Bay, White's Landing, Cottonwood, Bulrush, and Silver Canyons, Little Harbor, old quarry above Empire Landing, Cherry Valley, Johnson's Landing.

LUPINUS SUCCULENTUS Dougl. ex K. Koch [*L. affinis* Agardh] Frequent succulent, relatively glabrous annual of open, grassy slopes and dry, rocky ridges and bluffs over island, 15–1500 ft: Pebbly Beach Road, Avalon, Gallagher's, Toyon, and Bulrush Canyons, Moonstone Cove, E slope Black Jack Mt., Little Harbor, Isthmus, Howland's Landing.

LUPINUS TRUNCATUS Nutt. ex H. & A. Frequent annual of dry, rocky slopes and ridges, 50–1000 ft: Renton Mine, Hamilton, Middle Ranch, and Cottonwood Canyons, White's Landing, Little Harbor, Cherry Valley, Howland's Landing.

**MEDICAGO POLYMORPHA* L. [*M. hispida* Gaertn.] Bur-clover. Common Eurasian-North African procumbent annual over island on grassy hillsides, rocky roadsides, and disturbed places generally, 25–1350 ft: Renton Mine, Avalon, Hay Press area, Moonstone Cove, Cottonwood Canyon Beach, old quarry W of Empire Landing, Emerald Bay, Parsons' Landing. Much less common, as in Bulrush Canyon, is the form lacking hooked prickles on the fruit.

**MEDICAGO SATIVA* L. Alfalfa. This commonly cultivated Mediterranean perennial escapes infrequently in the Avalon and Middle Ranch areas; it is probably not permanently established, 15–900 ft: Renton Mine road, Avalon Bay, Golf Links, Middle Ranch.

**MELILOTUS ALBUS* Desv. White Sweet-clover. This annual or biennial Eurasian weed is much less frequent on Catalina than the next species: Middle Ranch Canyon below Eagle's Nest, 180 m, *Fosberg S4603*, Apr. 10, 1931 (LAM); along road to Ben Weston Beach, 200 ft, *Thorne 36268*, Apr. 29, 1966; observed Avalon Canyon, June 22, 1965.

**MELILOTUS INDICUS* (L.) All. Yellow Sweet-clover. Common Eurasian annual or biennial over island on roadsides and in disturbed places generally, 5-600 ft: Pebbly Beach, Avalon, Swain's, Cape, Middle Ranch, and Bulrush Canyons, Little Harbor, old quarry above Empire Landing, Isthmus.

**SPARTIUM JUNCEUM* L. Spanish Broom. Showy Mediterranean shrub established on some Avalon slopes, *Thorne 36907*, May 20, 1967.

TRIFOLIUM AMPLECTENS T. & G. [*T. stenophyllum* Nutt.] Clover. Frequent slender annual over island on grassy slopes, 100-1430 ft: Avalon, Hay Press area, Salta Verde, near Buffalo Springs Reservoir, Little Harbor, Isthmus, Parsons' Landing.

TRIFOLIUM ALBOPURPUREUM T. & G. [*T. insularum* Kennedy, *T. Traskiae* Kennedy.] Rare annual which I collected only at the upper end of Bulrush Canyon on dry, open, clayey slope, 1000 ft, *Thorne 34603*, May 12, 1965. Two earlier specimens seen are: "common along summit," *Trask*, April, 1901 (LAS), and "common in few localities," *Trask*, March, 1901 (LAS). The type of *T. traskiae*, as reported by Millspaugh and Nuttall, is from Moonstone Beach.

TRIFOLIUM GRACILENTUM T. & G. Another apparently rare annual, 100-1400 ft: Avalon, *P. B. Kennedy*, Apr. 21, 1907; upper end Bulrush Canyon on dry, open, clayey slope, 1000 ft, *Thorne 34604*, May 12, 1965; grassy slopes above Gallagher's Canyon, E fork, 1400 ft, *Thorne 36355*, Apr. 30, 1966.

TRIFOLIUM MACRAEI H. & A. [*T. catalinae* Wats.] Rare annual of dry open slopes along coast, 50-900 ft: Little Harbor, *Dunkle 1766*, Mar. 31, 1928, and *Thorne 34585*, May 11, 1965; Parsons' Landing, *Dunkle 1839*, Apr. 10, 1928.

TRIFOLIUM MICROCEPHALUM Pursh. Frequent slender annual over island on grassy slopes or rocky bluffs, 200-1600 ft: Renton Mine, Avalon, upper end Gallagher's Canyon, SW slope of Mt. Orizaba, below Eagle's Nest, Cherry Valley. Reported by Millspaugh and Nuttall also from Big Wash and Middle Ranch Canyons.

TRIFOLIUM MICRODON H. & A. var. *PILOSUM* Eastw. Very rare annual, not recently collected: "one locality, canyon," *Trask*, May 1897 (US).

TRIFOLIUM PALMERI S. Wats. Also a very rare annual, not collected recently: sunny hillside W of Isthmus Harbor in thin layer of red soil over rock, 50-100 ft, *Wolf 3546*, May 11, 1932. This insular endemic is elsewhere found only on San Nicolas, San Clemente, and Guadalupe Islands.

**TRIFOLIUM REPENS* L. White Clover. Eurasian-North African lawn perennial found once in lawn at Middle Ranch, 700 ft, *Thorne 36699*, Sept. 16, 1966. Reported by Millspaugh and Nuttall also from Avalon.

TRIFOLIUM TRIDENTATUM Lindl. [inc. var. *ACICULARE* (Nutt.) McDer.] Common annual over island on grassy slopes, and dry, rocky banks, 75-1400 ft: Renton Mine, Avalon, Gallagher's, Bulrush and Cottonwood Canyons, N slope Black Jack Mt., Little Harbor, Howland's Landing.

**VICIA DASYCARPA* Ten. Vetch. Mediterranean annual established in Cape and Middle Ranch Canyons, where sown in the winter of 1961-62: *Raven 17789*, May 20, 1962; along small stream flowing from reservoir, upper end Cape Canyon, 1050 ft, *Thorne 36498*, June 1, 1966.

VICIA EXIGUA Nutt. Frequent slender annual over island on open, grassy or rocky slopes, 100-800 ft: Pebbly Beach, Hamilton's, Gallagher's, Middle Ranch, and Bulrush Canyons, Moonstone Cove, Little Harbor, Cherry Valley.

FAGACEAE

QUERCUS CHRYSOLEPIS Liebm. Canyon Oak. Rare, found only in small groves of trees to 1.5 ft DBH and 20-30 ft tall in open oak woodland along N-facing slopes of ridge running from S end Mt. Orizaba, S side of S fork of Fern Canyon, 1400-1600 ft, *Thorne 36430* and

36431, May 31, 1966. These trees show apparently different degrees of introgression from nearby and lower groves of *Q. tomentella* Engelm. Fruit have not yet been seen but it is doubtful that "pure" *Q. chrysolepis* still exists on the island.

QUERCUS DOUGLASII H. & A. Blue Oak. Two Catalina collections of Blakley's, 5475 and 5468 (SBBG), which we could not find, were determined by Prof. N. Mueller as this species. These specimens, when found, should be compared with the material of *Q. engelmannii* from the island.

QUERCUS DUMOSA Nutt. Scrub Oak. The most abundant, variable, and generally dominant small tree or large shrub on wooded slopes and ridges over island, 50–1600 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Middle Ranch, Bulrush, Silver and Cottonwood Canyons, slopes of Black Jack and Orizaba Peaks, Salta Verde, Isthmus, Cherry Valley, Parsons' Landing. I have seen specimens of this dominant component of the chaparral and oak woodland with trunks to 1 ft DBH and 25–30 ft tall. It thrives in the heavy clay, rocky clay, and coarse loam soils of the island and is extraordinarily variable in size, leaves, and fruit. It is apparently heavily introgressed from other oak species, probably most frequently from *Quercus lobata* Née.

QUERCUS ENGELMANNII Greene. Engelmann Oak. Rare spreading tree: head of Swain's Canyon, Jepson 3065, July 13, 1908 (JEPS); single low spreading tree with several main trunks to about 1 ft DBH, Bulrush Canyon, 800 ft, Thorne 34611, May 12, 1965.

QUERCUS LOBATA Née. Valley Oak, Roble. One specimen collected at Renton Mine by Pyeaff and Philbrick s. n., July 14, 1957 (UCSB) has been determined by Prof. N. Mueller as this species. On the mainland it is reported (pers. comm.) by Prof. Mueller to occur as far south as the Irvine Ranch. Surely this species is much involved in hybridization with *Q. dumosa* Nutt. on Catalina, as indicated by the following oak.

QUERCUS × *MACDONALDII* Greene [*Q. dumosa* Nutt. × *Q. lobata* Née.] This frequent, often large, spreading, conspicuous tree apparently represents the hybrid offspring and derivatives of the scrub and valley oaks and the most conspicuous members of a vast hybrid swarm resulting from the probable backcrossing of the F₁ hybrids with both putative parent species. I have seen specimens up to 40 and 50 ft in height and spread and with trunks to 2 ft DBH. Some of these more "typical" specimens have been found in Pebbly Beach, Hay Press, Middle Ranch, Bulrush, and Cottonwood Canyons, slopes of Black Jack Mt., SW of Empire Landing, and at the Isthmus, 120–1600 ft.

QUERCUS TOMENTELLA Engelm. Island Oak. Infrequent island endemic in groves in several of the deeper and moister canyons of SE half of island, 200–1600 ft: Pebbly Beach, Cherry, Gallagher's, Cape, and Fern Canyons. In Gallagher's Canyon, W fork, the groves form a discontinuous forest from about 200 to 1300 ft with some trees up to 70 or 80 ft tall and with trunks to 1 and 2 ft DBH. Many specimens on Santa Catalina seem to be heavily introgressed with genes from *Q. chrysolepis*, especially in the groves in open oak woodland along N-facing ridge running from the S end of Mt. Orizaba, S side S fork Fern Canyon, 1400–1600 ft (as Thorne 36420 and 36432, May 31, 1966). Most recently collected in Sweetwater Canyon, at top of side valley, 1250 ft, Thorne 36885, May 19, 1967.

FRANKENIACEAE

FRANKENIA GRANDIFOLIA Cham. & Schlecht. var. *GRANDIFOLIA* [*F. grandiflora* of Millsp. & Nutt.] Frequent suffrutescent perennial of salinas, beaches, and bases of shore bluffs along coast, rare inland in alkaline situations, sea level–300 ft: Pebbly, Ben Weston, and Cottonwood Canyon Beaches, Shark, Little, and Catalina Harbors, Indian Head Point, old quarry above Empire Landing, Parsons' Landing.

GENTIANACEAE

CENTAURIUM VENUSTUM (Gray) Robins. Canchalagua. Frequent annual of SE two-thirds of island on dry, open, eroded clayey or rocky slopes, 20–1600 ft: Pebbly Beach, Avalon, Gallagher's and Cape Canyons, slopes of Black Jack and Orizaba Peaks, Little Harbor, old quarry above Empire Landing.

GERANIACEAE

**ERODIUM CICUTARIUM* (L.) L'Hér. Filaree, Storks-bill. Very common Eurasian-North African weedy annual over island on roadsides, bare clayey slopes, and disturbed ground generally, 10–2000 ft: Pebbly Beach, Avalon, Gallagher's, Middle Ranch, Bulrush, Cottonwood, and

Cape Canyons, slopes of Orizaba and Black Jack Peaks, Isthmus, Parsons' Landing.

**ERODIUM MOSCHATUM* (L.) L'Hér. Frequent Mediterranean weedy annual over island on roadsides and disturbed ground, 100–900 ft: Renton Mine, Avalon Valley, Indian Head Point, quarry above Empire Landing, Isthmus, Parsons' Landing.

**ERODIUM OBTUSIPPLICATUM* (Maire, Weiller, & Wilcz) J. T. Howell. Locally abundant North African weedy annual in grassy places, 600–1250 ft: slopes above and along stream in Bulrush Canyon, 600–800 ft, *Thorne et al* 36750 and 36757, Mar. 18, 1967; observed in Swain's Canyon on E slope Black Jack Mt., 1250 ft, Mar. 19, 1967.

GERANIUM CAROLINIANUM L. Cranesbill. Infrequent annual of grassy, wooded canyon slopes of SE half of island, 125–1300 ft: Pebbly Beach, Hamilton, Gallagher's, Toyon, and Middle Ranch Canyons.

**PELARGONIUM* × *HORTORUM* Bailey. Fish-Geranium. This escape from cultivation is abundantly established on bluffs near Avalon: Pebbly Beach Canyon, *Piehl* 6234, Oct. 3–6, 1962 (SBBG); NE-facing bluff above road to Pebbly Beach, 100 ft, *Thorne* 36477, June 1, 1966.

HYDROPHYLLACEAE

EMMENANTHE PENDULIFLORA Benth. Whispering Bells. Infrequent annual about island on dry, rocky or grassy slopes and ridges, 50–1000 ft: Pacific Divide, upper Middle Ranch Canyon, Little Harbor, Cherry Valley, Howland's Landing.

ERIODICTYON TRASKIAE Eastw. Yerba Santa. Infrequent but locally abundant shrub in the vicinity of Black Jack Mt. and Mt. Orizaba in chaparral on rocky clay or eroded, clay soils, 15–1500 ft: White's Landing, Swain's, Sweetwater, and Cape Canyons, and near Black Jack Mine on shoulder of Black Jack Peak. Elsewhere known only from San Luis Obispo to Ventura Counties on the mainland.

EUCRYPTA CHRYSANTHEMIFOLIA (Benth.) Greene [*Ellisia chrysanthemifolia* Benth.] Common annual over island on moist, shaded slopes and bottoms of canyons, 100–1400 ft: Pebbly Beach, Hamilton, Gallagher's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons, SW slope of Mt. Orizaba, Cherry Valley.

NEMOPHILA MENZIESII H. & A. subsp. *MENZIESII* [*N. insignis* Dougl. ex Benth.] Baby Blue-Eyes. Very rare annual, not recently collected: "one locality, canyon under *Rhus diversiloba*," *Trask*, Apr. 1896 (US). Millspaugh and Nuttall report it from Middle Ranch Canyon.

PHACELIA CUCUTARIA Greene var. *HISPIDA* (A. Gray) J. T. Howell [*P. hispida* Gray] Common annual over island on sea bluffs and inland on dry, rocky slopes and ridges, 3–900 ft: Renton Mine, Avalon Bay, Moonstone Cove, Cottonwood Canyon, Little Harbor, Cherry Valley.

PHACELIA DISTANS Benth. Rare annual along coasts, 3–200 ft: "one locality near a beach," *Trask*, Mar. 1901 (LAM); Pebbly Beach, flat beach of pebbles, 1 m, *Fosberg* S4598, Apr. 13, 1931 (LAM); rocky bluff E side Catalina Harbor, 200 ft, *Thorne* 34525, May 11, 1965.

PHACELIA GRANDIFLORA (Benth.) A. Gray. Coarse annual collected once in coastal sage near Bird Park, Memorial Canyon, Avalon, *Raven* 17859, May 23, 1962.

PHACELIA LYONII A. Gray. Frequent annual on sea bluffs about the island, less common inland on dry, rocky slopes, 15–1500 ft: Avalon Bay, East Mt., Salta Verde, Middle Ranch Canyon, mouth of Gallagher's Canyon, above Empire Landing, Catalina Harbor, Cherry Valley, Parsons' Landing. This distinctive insular species is found elsewhere only on San Clemente Island.

PHACELIA VISCIDA (Benth.) Torr. Sticky Phacelia. Very rare annual, not recently collected: "infrequent in canyons," *Trask*, Apr. 1900 (US); "one locality," *Trask*, Mar. 1901 (US).

PHOLISTOMA AURITUM (Lindl.) Lilja ex Lindbl. [*Nemophila aurita* Lindl.] Fiesta Flower. Infrequent sprawling annual on wooded slopes and canyon bottoms, 100–900 ft: Pebbly Beach Canyon, right fork, 30 m, *Fosberg* S4592, Apr. 13, 1931; Cape Canyon, 900 ft, *Thorne* 35827; observed at White's Landing Apr. 6, 1966, and Toyon Canyon, Mar. 19, 1967.

PHOLISTOMA RACEMOSUM (Nutt.) Const. [*Nemophila eroditifolia* Millsp., *N. racemosa* Nutt.] Common sprawling annual of shady places over island, 50–1350 ft: Pebbly Beach, Avalon, Gallagher's, Middle Ranch, Bulrush, and Cottonwood Canyons, Moonstone Cove, Little Harbor, above Empire Landing, Isthmus, Cherry Valley, Parsons' Landing. Found also on other Channel Islands and the mainland from San Diego Co. to northern Baja California.

JUGLANDACEAE

JUGLANS CALIFORNICA S. Wats. Walnut. Several small trees up to 20 ft high, possibly introduced from the mainland, are growing near Farnsworth Loop, about 1300 ft, on the summit road from Avalon to the Airport: *Blakley* 5532, Apr. 7, 1963 (SBBG), and *Thorne* 34674, May 11, 1965; also bottom of Hamilton Canyon (which meets the Summit Road at Farnsworth Loop) by road, "probably introduced," 200 m, *Fosberg* S4848, May 12, 1931 (LAM). The walnut could have been introduced on the island by the Indian inhabitants though it is strange that this distinctive tree would have been missed, especially along the Summit Road, by such botanists as Blanche Trask, L. W. Nuttall, and C. F. Millspaugh.

LAMIACEAE (LABIATAE)

LEPECHINIA FRAGRANS (Greene) Epling [*Sphacele fragrans* Greene] Pitcher-sage. Rare shrub in chaparral and coastal sage scrub on dry slopes of Black Jack Mt., 700–1350 ft: "rare, one volcanic region," *Trask*, May 1901 (LAM); floor of Cape Canyon not far above mouth, *Fosberg* S4786, May 6, 1931 (POM, LAM); upper end Cape Canyon, *Raven* 17788, May 20, 1962; E side Black Jack Mt. below junction of Airport Road and road to White's Landing, 1200–1350 ft, *Blakley* 5579, Apr. 10, 1963 (SBBG), and *Thorne and Carlquist* 36329, Apr. 29, 1966. Found elsewhere on Santa Cruz and Santa Rosa Islands and the San Gabriel and Santa Monica Mts. of the mainland.

**MARRUBIUM VULGARE* L. Horehound. Common European shrubby perennial over island on dry, rocky or grassy slopes and in weedy places generally, 100–1300 ft: Renton Mine ridge, Avalon, Descanso, Gallagher's, Swain's, Cape, and Cottonwood Canyons, quarry above Empire Landing.

**MENTHA* × *PIPERITA* L. [*M. aquatica* L. × *M. spicata* L.] Peppermint. This introduced European hybrid perennial is established at several points and is particularly abundant with *M. spicata* along the stream in the lower portion of Middle Ranch Canyon: shallow running water of stream bed, Middle Ranch Canyon, 300 ft, *Thorne* 34954, June 23, 1965; dense stand under run-off pipe from water tank in Swain's Canyon, 200 ft, *Thorne* 36521, June 2, 1966.

**MENTHA SPICATA* L. Spearmint. European perennial established in Middle Ranch Canyon: clear water of stream bed in upper Middle Ranch Canyon just below small reservoir, 900 ft, *Thorne* 36299, Apr. 29, 1966; shallow water of small stream in lower Middle Ranch Canyon about ¼ mile above Ben Weston Beach, *Thorne* 36637, Sept. 14, 1966.

**NEPETA CATARIA* L. Catnip. This Eurasian weedy perennial was collected once near Avalon: Chicken Johnny's ranch, 75 ft, *R. L. Pendleton* 1391, July 3, 1909. It persisted at least until 1920 when collected by Millspaugh and by Nuttall but has not apparently been collected since.

SALVIA APIANA Jeps. [*Ramona polystachya* (Benth.) Greene] White Sage. Frequent and often locally abundant shrub of SE half of island on dry rocky slopes and ridges, often a component of the coastal sage scrub, 500–1400 ft: Renton Mine ridge, Pebbly Beach, Avalon, Cape, Middle Ranch, and Bulrush Canyons, near Wrigley Reservoir.

SALVIA APIANA Jeps. × *SALVIA MELLIFERA* Greene. Plants intermediate between and adjacent to the putative parent species were observed infrequently: Cape Canyon, *Fosberg* S4805 (POM, LAM) and S4809 (LAM), May 6, 1931, and *Thorne* 34431, May 10, 1965; observed in Bulrush Canyon, May 12, 1965.

SALVIA COLUMBARIAE Benth. Chia. Infrequent annual on dry, rocky or grassy slopes, 100–600 ft: White's Landing, Cape and Cottonwood Canyons, Cherry Valley.

SALVIA MELLIFERA Greene [*Ramona stachyoides* (Benth.) Briquet] Black Sage. Very common shrub over island on dry, exposed slopes in clay or rocky clay soils; one of the most abundant components of coastal sage scrub and usually present in understory of chaparral, 30–1600 ft: East Mt., Pebbly Beach, Avalon, Swain's, Cape, Middle Ranch, and Bulrush Canyons, slopes of Black Jack Mt., above Empire Landing, Isthmus.

SATUREJA DOUGLASII (Benth.) Briq. [*Micromeria chamissonis* (Benth.) Greene] Yerba Buena. Infrequent trailing perennial of SE half of island in moist, shaded places near stream beds in Middle Ranch and Bulrush Canyons, 250–800 ft.

TRICHOSTEMA LANCEOLATUM Benth. Vinegar Weed. Infrequent, strong scented annual over island on dry, clayey slopes and ridges, 400–1450 ft: near Hay Press Reservoir and adjacent

ridges above Banning's and Gallagher's Canyons, near Buffalo Springs Reservoirs, above Parsons' Landing.

LINACEAE

HESPEROLINON MICRANTHUM (A. Gray) Small. Wild Flax. Rare annual found recently for the first time on the Channel Islands on a dry, rocky slope, Salta Verde, *Thorne and Philbrick* 36880, May 28, 1967.

LOASACEAE

MENTZELIA AFFINIS Greene [*Acrolasia gracilenta* of Millsp. & Nutt.] Rare annual, not recently collected: "few plants in one locality," *Trask*, Mar. 1901 (LAM); *A. Eastwood*, July 20-25, 1917 (CAS).

MENTZELIA MICRANTHA (H. & A.) T. & G. [*Acrolasia micrantha* (H. & A.) Rydb., *A. catalinensis* Millsp.] Rare annual of rocky bluffs and talus on Channel coast, 25-250 ft: road east of Avalon, 30 ft, *R. L. Pendleton*, July 2, 1909 (F) (type of *A. catalinensis* Millsp.); base of bluff at Pebbly Beach, 25 ft, *Wolf* 3447, May 9, 1932, and *Thorne* 36470, June 1, 1966; divide between Hamilton and Descanso Canyons, 75 m, *Fosberg* 687, Apr. 9, 1931 and S4337, Mar. 23, 1931 (LAM); rocky soil on point at W side Fourth of July Cove, 100 ft, *Wolf* 3568, May 11, 1932.

LYTHRACEAE

AMMANIA COCCINEA Rottb. Rare annual found in abundance on the desiccated muddy margin of Hay Press Reservoir, 1350 ft, *Thorne* 36710, Sept. 16, 1966.

MALVACEAE

**ALTHAEA ROSEA* (L.) Cav. Hollyhock. Found once as escape, or perhaps planted there, at upper end of road in Pebbly Beach Canyon near city dump, 300 ft, *Thorne* 36475, June 1, 1966.

LAVATERA ASSURGENTIFLORA Kell. Malva Rosa. As a native to Santa Catalina this beautiful island endemic is now limited to low thickets on Bird Rock off Fisherman's Cove at the Isthmus and Indian Rock in Emerald Bay. In the guano-enriched, thin soil on these two islets, this mallow forms thickets to about 1 meter high mixed, at least on Bird Rock, with *Coreopsis gigantea*, *Opuntia*, *Malva parviflora*, and several annual grasses. A few shrubs, apparently of the Anacapa race, are cultivated in Avalon and have become established in the Avalon area where protected from depredation by goats. It is quite possible that before the advent of feral goats and other herbivores on Santa Catalina, the malva rosa may have formed thickets or groves of small trees on the main island, as reported for San Clemente Island (Raven, 1963). (Fig. 16).

MALACOTHAMNUS FASCICULATUS (Nutt. in T. & G.) Greene subsp. *catalinensis* (Eastw.) comb. nov. (based on *Malvastrum catalinense* Eastw. Lflets. W. Botany 1: 215. 1936.) [*Malvastrum fasciculatum* (Nutt.) Greene] Tree Mallow. Common shrub, or rarely 10 to 15 ft high and tree-like, over island on dry, rocky slopes, road-cuts, and dry creek beds, frequently in coastal sage scrub, 15-1300 ft: Avalon, Gallagher's, Swain's, Middle Ranch, and Bulrush Canyons, White's Landing, Little Harbor, Empire Landing, Isthmus, Parsons' Landing. This geographic race is better treated, I think, as a subspecies. It is otherwise known apparently only from the Santa Monica Mts.

**MALVA PARVIFLORA* L. Cheeses. Frequent Mediterranean annual weed over island on roadsides, in disturbed ground, and in weedy places generally, 15-1450 ft: Pebbly Beach, Avalon Valley, Hay Press area, Middle Ranch, Moonstone Cove, Indian Head Point, Bird Rock.

MALVASTRUM EXILE A. Gray. Rare annual, not recently collected: "sandy bed of streams," *Trask*, Mar. 1901 (LAM).

SIDA HEDERACEA (Dougl.) Torr. ex A. Gray. Alkali Mallow. Rare perennial, collected only from banks around Wrigley Reservoir at summit of island road, 1400 ft, few in silty clay soil, *Blakley* 5378, Oct. 3, 1962 (SBBG).

MORACEAE

**FICUS CARICA* L. Fig. This Mediterranean shrub or small tree occurs here and there

spontaneously about the island, apparently naturalized by ravens carrying fruit from cultivated trees in Middle Ranch and Avalon Canyons: rather bare, goat-grazed SW slope of Mt. Orizaba, 1900 ft, large shrub 2–3 m tall, *Thorne* 36421, May 31, 1966; observed on Salta Verde, Mar. 18, 1967.

MYRTACEAE

**EUCALYPTUS* spp. Seedlings of several Australian species can be found established on slopes near planted trees.

NYCTAGINACEAE

ABRONIA MARITIMA Nutt. ex S. Wats. Sand-verbena. Succulent prostrate perennial locally abundant in sand of beaches and dunes of Pacific shore between Ben Weston Beach and Little Harbor, 5–10 ft: Ben Weston, Cottonwood Canyon, Shark Harbor, and Little Harbor beaches.

ABRONIA UMBELLATA Lam. Another succulent prostrate perennial found only on dunes and foredunes at Ben Weston Beach, 10 ft, *Thorne* 34934, June 23, 1965.

MIRABILIS LAEVIS (Benth.) Curran. [*Hesperonia californica* Standl.] Four-O'Clock. Common perennial over island on dry, rocky slopes and ridges, especially on sea-bluffs and in coastal sage scrub and among cactus clumps, 30–550 ft: Lookout Point, Avalon, Gallagher's, Cape, and Middle Ranch Canyons, Salta Verde, Little Harbor, Empire Landing, Isthmus, Cherry Valley, Parsons' Landing.

CLARKIA EPILOBIODES (Nutt.) Nels. & Macbr. [*Godetia epilobioides* (Nutt.) S. Wats.] Common slender annual over island on grassy hillsides and dry, rocky slopes, 100–1350 ft: Renton Mine, Avalon, Gallagher's, Fern, Middle Ranch, and Bulrush Canyons, Empire Landing, Isthmus, Emerald Bay.

CLARKIA PURPUREA (Curt.) Nels. & Macbr. subsp. *QUADRIVULNERA* (Dougl. ex Lindl.) Lewis & Lewis [*Godetia quadrivulnera* (Dougl. ex Lindl.) Spach] Frequent annual of grassy, clayey slopes, 400–1400 ft: Renton Mine, Avalon, Gallagher's, Middle Ranch, and Bulrush Canyons, Hay Press area, Emerald Bay.

EPILOBIUM ADENOCaulon Hausskn. var. *HOLOSERICEUM* (Trel.) Munz. Willow Herb. [*Epilobium holosericeum* Trel.] Infrequent perennial along streams in canyons of SE half of island, 100–550 ft: lower parts of Middle Ranch and Cottonwood Canyons.

**GAURA SINUATA* Nutt. ex Ser. in DC. Weedy perennial native to south central United States and northern Mexico, found once as prostrate weed near riding stables, Avalon, 100 ft, *Thorne* 36478, June 1, 1966.

OENOTHERA LEPTOCARPA Greene [*Camissonia californica* (Nutt. ex T. & G.) Raven] Rare annual, not recently collected: "rare, two localities, dry and rocky slopes," *Trask*, May 1897 (US); talus slope below Coach Road, 400 ft, *Dunkle* 1943, May 13, 1928.

OENOTHERA MICRANTHA Hornem. ex Spreng. [*Sphaerostigma micranthum* (Hornem. ex Spreng.) Walp., *Camissonia micrantha* (Hornem. ex Spreng.) Raven] Infrequent annual of SE half of island in dry sandy stream beds, muddy reservoir margins, talus, and dry slopes, 10–1100 ft: near Bird Park, Avalon, mouth of Hamilton Canyon, Wishbone Loop of Summit Road, Cape Canyon Reservoir, Bulrush Canyon, behind Ben Weston Beach. These collections actually represent three different taxa shortly to be published as three distinct species in *Camissonia* by Raven (pers. comm.).

ZAUSCHNERIA CALIFORNICA Presl subsp. *CALIFORNICA* [*Z. californica* Presl subsp. *angustifolia* Keck] California-fuchsia. Infrequent suffrutescent perennial of dry slopes and bottoms of canyons of S half of island, 15–1400 ft: Renton Mine, near Wrigley Reservoir, Middle Ranch Canyon, Little Harbor, Catalina Beach.

ZAUSCHNERIA CALIFORNICA Presl subsp. *MEXICANA* (Presl) Raven [inc. *Z. villosa* Greene] One collection fitting the description of this subspecies was found with preceding taxon in grassy, weedy flat area behind dunes and salina at Little Harbor, 15 ft, *Thorne* 36662, Sept. 14, 1966.

ZAUSCHNERIA CANA Greene. Infrequent perennial of dry, rocky canyon bottoms and slopes and sea-bluffs, 20–1400 ft: lower parts of Big Wash, Descanso, and Hamilton Canyons, near Wrigley Reservoir, bluffs between Isthmus Harbor and Fisherman's Cove.

These three taxa approach each other closely and deserve thorough study particularly on this island where they often grow together.

OROBANCHACEAE

OROBANCHE BULBOSA (A. Gray) G. Beck [*Myzorrhiza tuberosa* (A. Gray) Rydb.] Broomrape. Rare parasite on roots of *Adenostoma fasciculatum* in chaparral on slopes of Black Jack Mt., 1000–1350 ft: dry, eroded, clayey E slopes of Black Jack Mt. in Swain's Canyon, 1100–1350 ft, *Fosberg* S4687, Apr. 23, 1931; *Blakley and Piehl* 5436, Oct. 5, 1962 (SBBG); *Thorne* 36327, Apr. 29, 1966; ravine at S side Black Jack Peak, below houses for workers, 1000 ft, *Wolf* 4232, Oct. 5, 1932.

OROBANCHE CALIFORNICA Cham. & Schlecht. Found only once at Ben Weston Beach on low sandy flat behind dunes, attached to roots of *Haplopappus venetus* subsp. *furfuraceus*, 10 ft, *Thorne and Everett* 34932, June 23, 1965. (Fig. 28). This material, according to Dr. L. R. Heckard, is related to the vars. *californica* and *parishii* Jeps., and is similar to collections from Santa Rosa, San Miguel, and San Nicolas Islands.

OROBANCHE FASCICULATA Nutt. var. *FRANCISCANA* Achey [*Thalesia fasciculata* (Nutt.) Britt.] Rare parasite on dry, rocky banks: road E of Avalon, 20 ft, R. L. Pendleton, July 2, 1909; W-facing rocky bank and talus near upper end of Renton Mine road in Pebbly Beach Canyon, 850 ft, *Thorne* 36235, Apr. 28, 1966. Reported by Millspaugh and Nuttall also from top of Mt. Wilson and on trail from Moonstone Beach to White's Landing.

OXALIDACEAE

OXALIS ALBICANS HBK. subsp. *CALIFORNICA* (Abrams) Eiten [*Xanthoxalis californica* Abrams] Sour-grass. Rare perennial, not recently collected: "one locality, sea edge," *Trask*, Apr. 1902 (LAM); Pebbly Beach Canyon, right fork, N wall near bottom, 35 m, *Fosberg* S4586, Apr. 13, 1931 (POM, LAM).

**OXALIS CORNICULATA* L. Eurasian perennial weed found established only in lawns in Avalon, 20 ft: edge of lawn, *Thorne* 36428, May 31, 1966, and gravel bed along walk, *Thorne* 36331, Apr. 30, 1966.

**OXALIS PES-CAPRAE* L. [*Bolboxalis cernua* (Thunb.) Small] Bermuda-buttercup. Showy South African perennial from bulbiferous rhizome escaped from cultivation and well established in the Avalon area and infrequently elsewhere about the island, 15–100 ft: Avalon Valley, Avalon Bay, Descanso Canyon, Toyon Canyon, Moonstone Cove.

PAPAVERACEAE

DENDROMECON RIGIDA Benth. subsp. *rharnoides* (Greene) comb. nov. (based on *D. rharnoides* Greene, Pittonia 5: 305. 1905.) [inc. *D. arborea* Greene] Tree Poppy. Infrequent large shrub, though conspicuous and often collected, at scattered points along Channel slope on dry, eroded slopes and ridges, canyon bottoms, and such disturbed places as rocky road cuts and mine talus, 30–1600 ft: Renton Mine, slopes of Black Jack Mt. (where usually collected), and several points between Cherry Valley and Johnson's Landing. *Trask* described the plant as "rare on wild and broken edges, 10–20 ft tall," Mar. 1901 (LAM). Specimens of the tree poppy from Santa Catalina and San Clemente Islands and from the Santa Monica Mts., at least in their leaves, seem to be consistently intermediate between *D. rigida* subsp. *rigida* and *D. rigida* subsp. *harfordii* (Kell.) Raven, hence, equally worthy of subspecific recognition as a geographic race. (Fig. 8).

**ESCHSCHOLZIA CALIFORNICA* Cham. var. *CALIFORNICA*. California Poppy. This typical, heavy-rooted, perennial race is apparently not indigenous on Catalina. Specimens collected in the upper end of Middle Ranch Canyon, 900 ft, *Thorne* 34988, June 23, 1965 were apparently scattered there from seed packets.

ESCHSCHOLZIA CALIFORNICA Cham. var. *PENINSULARIS* (Greene) Munz [*Eschscholtzia Wrigleyana* Millsp.] California Poppy. Common and conspicuous annual over island on grassy slopes, dry, exposed, rocky banks and ridges, talus, and sandy or gravelly bottoms of arroyos, 30–1600 ft: Renton Mine, Avalon, Gallagher's, Toyon, Cape, and Middle Ranch Canyons, Moonstone Cove, W slope Black Jack Mt., at and between Fourth of July Valley and Johnson's Landing. This is the southern and San Joaquin Valley annual race of the California Poppy.

ESCHSCHOLZIA RAMOSA (Greene) Greene [*Eschscholtzia elegans* of Millsp. & Nutt.] Frequent annual, an island endemic, on grassy slopes, dry, rocky sea-bluffs and canyon slopes, and along dry streams, 10–1000 ft: Pebbly Beach, Gallagher's, Cape, and Cottonwood Canyons, White's

Landing, Little Harbor, Isthmus. Known otherwise only from the Santa Barbara Islands south to the islands along the Baja California coast and Guadalupe Island but not from the mainland.

**PAPAVER SOMNIFERUM* L. Opium Poppy. This Old World garden annual was found once probably as an escape in an open field near small building in Pebbly Beach Canyon, about 300 ft, *Thorne* 36476, June 1, 1966.

PLATYSTEMON CALIFORNICUS Benth. [*P. cernuus* Greene] Cream Cups. Rare annual not recently collected on Catalina though reported by Millspaugh and Nuttall from "grassy hill-sides plentiful where found." I was unable to find it at the one location listed, slopes at head of Gallagher's Canyon. I have seen one specimen: without definite locality, *T. S. Brandegee*, May 1890 (UC).

**ROMNEYA COULTERI* Harv. Matilija Poppy. This large, conspicuous perennial from the mainland of southern California is well established S of the Avalon golf links in the open, flat sandy bottom of Avalon Valley, about 300 ft, *Thorne* 34923, June 22, 1965. It must be a relatively recent introduction for surely it is much too conspicuous to be overlooked by the numerous botanists who have collected over the years in the Avalon area.

STYLOMECON HETEROPHYLLA (Benth.) G. Tayl. [*Papaver heterophyllum* Greene] Wind Poppy. Rare annual of rocky, sunny canyon slopes: near Renton Mine, 850 ft, *Thorne* 36223, Apr. 28, 1966; W fork of Gallagher's Canyon, 500 ft, *Thorne* 36337, Apr. 30, 1966.

PITTOSPORACEAE

**SOLLYA FUSIFORMIS* Briq. [*Vinca minor* of Millsp. & Nutt.] A blue-flowered shrubby vine from Australia which rarely escapes or persists from cultivation in the Avalon area: sea bank near the Sugar Loaf, *Nuttall* 801, June 28, 1920 (F); near Wrigley Memorial back of Avalon, probably planted there, 100 ft, *Thorne* 36479, June 1, 1966.

PLANTAGINACEAE

**PLANTAGO CORONOPUS* L. [*P. Parishii* Macbr.] Rattail Plantain. Common European annual over island on saline flats, desiccated swales and margins of reservoirs and pools, and dry, bare ridges and bluffs, 5-1430 ft: Pebbly Beach, Hay Press area, Echo Lake, Eagle's Nest, Bulrush Ridge, Little Harbor, Isthmus, Parsons' Landing.

PLANTAGO ERECTA Morris [*P. Bigelovii* of Millsp. & Nutt., *P. dura*, *P. speciosa*, and *P. obversa* Morris, *P. Hookeriana* F. & M. var. *californica* (Greene) Poe] Very common villose annual over island on dry, bare, eroded clayey or rocky slopes and ridges, ledges, sea-bluffs, washes, shaded canyons, salinas, and disturbed ground, 6-1430 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons, Salta Verde, Buffalo Springs Reservoir, Cherry Valley, Parsons' Landing.

PLANTAGO INSULARIS Eastw. var. *INSULARIS*. Frequent annual of dry, bare ridges, mountain slopes, sea-bluffs, and reservoir margins, of SE half of Santa Catalina, 50-1600 ft: Hamilton Canyon, mouth of Gallagher's Canyon, upper slopes of Black Jack and Orizaba Mts., Salta Verde, Bulrush Ridge, Little Harbor, Buffalo Springs Reservoir.

**PLANTAGO MAJOR* L. Common Plantain. Eurasian perennial weed rare in lawns in the Avalon area: lawn of the razed St. Catherine's Hotel, Descanso Canyon, 15 ft, *Thorne* 36485, June 1, 1966; hotel lawn in Avalon.

PLATANACEAE

PLATANUS RACEMOSA Nutt. Aliso, Sycamore. This large tree was found in alluvial soil along the stream bed on Escondido Ranch in Cottonwood Canyon, about 350 ft, *Thorne* 36691, Sept. 15, 1966. The largest tree of several along the stream is perhaps 60 ft tall and at least 2 ft DBH. These trees may have been planted, and it does seem strange that they would have been overlooked, if indigenous, by Blanche Trask and other botanists who have collected on the island. However, the large size of the trees indicates that they have been in Cottonwood Canyon a long time.

PLUMBAGINACEAE

**LIMONIUM PEREZII* F. T. Hubb. A beautiful Canary Island perennial well established in the Avalon area: escaped to rocky slopes and banks of dry stream bed near Wrigley Memorial

in Avalon Canyon, 400 ft, *Thorne* 34915, June 22, 1965; Hamilton Canyon, June 23, 1965.

POLEMONIACEAE

ALLOPHYLLUM GLUTINOSUM (Benth.) A. & V. Grant [*Gilia Traskiae* Eastw., *G. glutinosa* (Benth.) A. Gray] Infrequent annual of roadsides, rocky banks, canyon slopes, talus, sometimes with coastal sage and chaparral, 90–900 ft: Renton Mine, Avalon, Hamilton, and Gallagher's Canyons, Summit Road.

ERIASTRUM FILIFOLIUM (Nutt.) Woot. & Standl. [*Navarretia filifolia* (Nutt.) Brand] Rare annual found on grassy ridge top between Moonstone and White's Coves, V. Grant 18440, May 3, 1953, and *Thorne* 36527, June 2, 1966.

GILIA ANGELENSIS V. Grant [*G. multicaulis* Benth.] Common small annual of grassy or rocky slopes and ridges over island, 50–1400 ft: Hamilton, Gallagher's, Swain's, Cape, Middle Ranch, and Cottonwood Canyons, Moonstone Cove, Little Harbor, old quarry above Empire Landing, Cherry Valley, Johnson's Landing.

GILIA CAPITATA Sims subsp. *ABROTANIFOLIA* (Nutt. ex Greene) V. Grant. Rare annual, collected only on roadside S of golf links, back of Avalon, 100 ft, *Thorne* 36195, Apr. 28, 1966. This specimen shows perhaps some introgression from *G. angelensis*. On the other hand, the specimen of *G. angelensis* from Cherry Valley, dry, SSE-facing rocky slope, 200 ft, *Thorne* 35938, Apr. 7, 1966 seems to show introgression from *G. capitata abrotanifolia*.

GILIA NEVINII A. Gray. Infrequent annual of rocky headlands and sea-cliffs along the coast of SE half of island, rare inland on canyon slopes, 30–450 ft: Avalon Canyon, Hamilton Beach, ridge between Moonstone and White's Coves, Little Harbor. This *Gilia* is found elsewhere only on San Clemente and Guadalupe Islands.

LINANTHUS BICOLOR (Nutt.) Greene [*Gilia bicolor* (Nutt.) Brand.] Rare annual of grassy slopes, not recently collected: Cottonwood Canyon, 600 ft, *Dunkle* 1795, Mar. 31, 1928. Millspaugh and Nuttall list it also from Fisherman's Cove and Moonstone Beach.

LINANTHUS DIANTHIFLORUS (Benth.) Greene [*Gilia dianthoides* Endl.] Infrequent annual of grassy, bare, or dry, rocky slopes, mostly on NW half of island, 200–1500 ft: N slope Black Jack Mt., W of Empire Landing, Isthmus, Parsons' Landing. Recorded also by Millspaugh and Nuttall from Salta Verde and Fisherman's Cove.

NAVARRETIA ATRACTYLOIDES (Benth.) H. & A. [probably *N. viscidula* of Millsp. & Nutt.] Infrequent annual on SE half of island on dry, clayey, grassy or bare, eroded slopes, 75–1500 ft: Chicken Johnnie's Ranch near Avalon, 75 ft, *R. L. Pendleton* 1392, July 3, 1909: no definite location, *Piehl* 62477 (in part), Oct. 3–6, 1962 (SBBG); canyon above Avalon, 600 ft, *Thorne* 34905, June 22, 1965; slopes above Gallagher's Canyon, 1400 ft, *Thorne* 36353, Apr. 30, 1966; hillside along Summit Road before junction with road to Middle Ranch, 1500 ft, *Thorne* 36308, Apr. 29, 1966; near Cape Canyon Reservoir, 1100 ft, *Thorne* 36503, June 1, 1966. This species is extremely variable and the Santa Catalina specimens diverge considerably from much of the mainland material in the leaves and very broad, ovate, nearly entire involucre bracts.

NAVARRETIA HAMATA Greene var. *HAMATA*. Common small annual over island on dry, grassy or bare, eroded clay or rocky clay slopes, 50–1500 ft: Wrigley Drive, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, and Cottonwood Canyons, Hay Press area, Echo Lake, Empire Landing, Isthmus, Cherry Valley.

NAVARRETIA HAMATA Greene var. *foliacea* (Greene) comb. nov. (based on *N. foliacea* Greene, *Pittonia* 1: 138, 1887). [*N. hamata* Greene subsp. *foliacea* (Greene) Mason] One collection with softer, more herbaceous leaves was made on dry eroded sunny slopes in Cottonwood Canyon on Rancho Escondido, 700 ft, *Thorne* 35019, June 24, 1965. Since this variety occurs occasionally with the typical variety, I see no reason to accord this variant more than varietal rank.

POLYGONACEAE

CHORIZANTHE CORIACEA Goodm. [*Lastarriaea chilensis* of Millsp. & Nutt.] Rare fragile annual collected only on dry, open, clay slope at upper end of Bulrush Canyon, 1000 ft, *Thorne* 34600, May 12, 1965. Collected earlier by Trask and Brandegee.

CHORIZANTHE STATICOIDES Benth. Turkish Rugging. Another rare annual, collected most

recently by *Fosberg S4917* at head of Swain's Canyon, base of Black Jack Peak on dry open E slope, 350 m, May 19, 1931. Collected earlier by Lyon and Trask.

ERIOCONUM GIGANTEUM S. Wats. subsp. *GIGANTEUM*. St. Catherine's Lace. Common endemic shrub on Channel slope on dry, rocky slopes, ridges, and promontories, usually as component of coastal sage scrub, less common away from coast, and rare across Pacific Divide, 50–1500 ft: Renton Mine, Pacific Divide, Lookout Point, Avalon, Hamilton, Gallagher's, Swain's, and Middle Ranch Canyons, White's Landing, E slope Black Jack Mt., Isthmus. This beautiful shrub can reach small tree proportions, for one shrub along the dry stream bed in lower Hamilton Canyon had one stem to 12 ft with a 4 ft spread and a trunk diameter of 5 inches at 3 ft (*Thorne and Everett 35013*, June 23, 1965). (Fig. 22). This taxon is restricted to Santa Catalina with the var. *compactum* Dunkle, probably better treated as a subspecies, on Santa Barbara Island and the subsp. *formosum* (K. Brandeg.) Raven on San Clemente Island.

ERIOCONUM LATIFOLIUM Sm. subsp. *GRANDE* (Greene) S. Stokes [*E. nudum* Dougl. ex Benth.] Wild Buckwheat, Tibinagua. Common shrub of sea-cliffs, often as component of coastal sage scrub, around island, 15–400 ft: Pebbly Beach, Avalon Bay, mouths of Hamilton and Gallagher's Canyons, White's Landing, Ben Weston Beach, Little Harbor, Isthmus, Parsons' Landing. Known only from the Channel Islands and Baja California.

**POLYGONUM ARENASTRUM* Bor. [*P. aviculare* of Millsp. & Nutt.] Knotweed. Infrequent prostrate or sprawling annual weed from western Eurasia, mostly on desiccated margins of reservoirs, roadsides, and disturbed ground on SE half of island, 20–1350 ft: Pebbly Beach terminal, Hay Press Reservoir, Echo Lake, Swain's Canyon on E slope Black Jack Mt., near Middle Ranch dam, Isthmus Road near bridge over Cottonwood Creek.

**POLYGONUM ARGYROCOLEON* Steud. ex Kunze. Rare erect West Asian annual weed not recently collected: by rock crusher at Pebbly Beach, 15–75 ft, *Wolf 4216*, Oct. 3, 1932, and *Fosberg S4461*, Apr. 3, 1931; roadside near golf links in Avalon Valley, 30 m, *Fosberg S4510*, Apr. 8, 1931 (LAM); roadside at Sugarloaf Point, 5 m, *Fosberg S4565*, 1931 (LAM).

POLYGONUM COCCINEUM Muhl. Rare perennial, now presumably eliminated from its one station: rooted in 30 ft of water in reservoir behind new dam at Middle Ranch, *D. Propst*, spring 1966. The plant was pulled up the first time discovered but reappeared on the surface. Because of its possible menace in the reservoir, a diver was sent down to remove the entire rhizome.

PTEROSTEGIA DRYMARIOIDES F. & M. Infrequent decumbent annual in moist, shaded places on Channel slope, rare on Pacific slope, 100–1600 ft: Renton Mine, Hamilton, Gallagher's, and Bulrush Canyons, S slope Mt. Orizaba, Fourth of July Cove, Cherry Valley.

**RUMEX CONGLOMERATUS* Muft. Eurasian-North African biennial or perennial weed collected only in Middle Ranch Canyon: mud above dam near Eagle's Nest, *Fosberg S5369*, July 10, 1931 (POM, LAM); marshy hole near pumphouse at Middle Ranch dam, *Fosberg S4747*, May 2, 1931 (LAM).

**RUMEX CRISPUS* L. Curled Dock. Frequent European-African perennial weed of reservoir margins, stream beds, swales, and other moist places over island, 15–1400 ft: Avalon Valley, Hay Press area, Toyon and Middle Ranch Canyons, Cottonwood Canyon beach, Little Harbor, Isthmus, Parsons' Landing.

RUMEX SALICIFOLIUS Weinm. Willow Dock. Frequent perennial of SE half of island in stream beds, reservoir margins, and muddy pools, 10–1350 ft: Hay Press Reservoir, Echo Lake, Cape, Middle Ranch, and Cottonwood Canyons. One form lacking callosities on the inner sepals was collected at Echo Lake, a few at edge of vernal pool, *Blakley 5593*, Apr. 10, 1963 (SBBG). This has been named *R. salicifolius* f. *ecallosus* J. T. Howell, a treatment which seems to me much more realistic (if taxonomic recognition must be given at all) than awarding such a minor form specific rank as *R. californicus* Rech. f.

PORTULACACEAE

CALANDRINIA CILIATA (R. & P.) DC. var. *MENZIESII* (Hook.) Macbr. [*C. Menziesii* (Hook.) T. & G.] Red Maids, Kisses. Infrequent spreading annual of SE half of island on dry, grassy, or bare clayey slopes, 200–1400 ft: ridge S of Avalon Valley above Avalon Terrace, Rock Spring, Gallagher's, Middle Ranch, and Bulrush Canyons, S slope of Mt. Orizaba.

CALANDRINIA MARITIMA Nutt. in T. & G. Sea Kisses. Rare fleshy annual of rocky bluffs

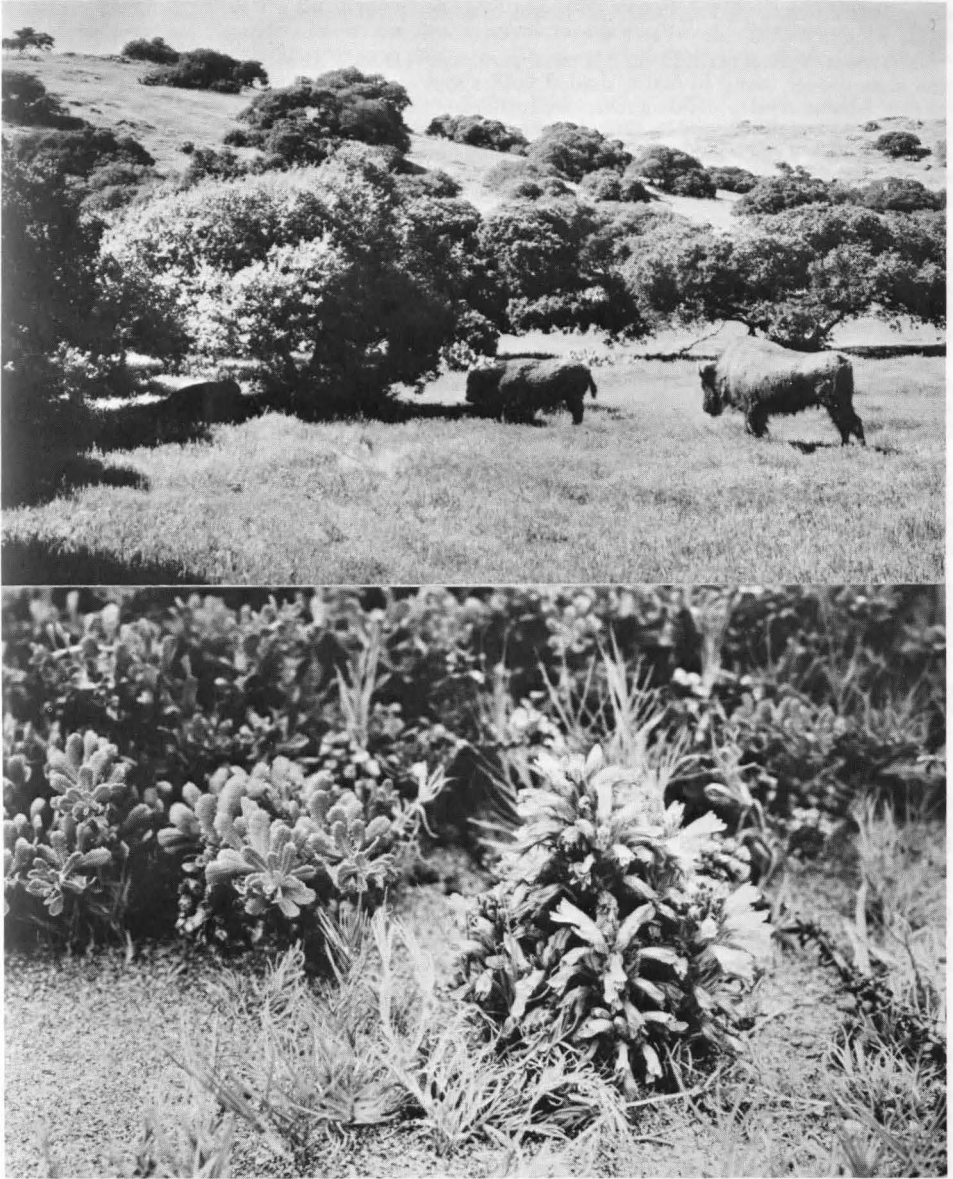


Fig. 27. Introduced bison in oak woodland, with *Quercus dumosa* and *Rhamnus piriifolia*, near Echo Lake.

Fig. 28. Broom-Rape, *Orobanche californica*, parasitic on roots of *Haplopappus venetus furfuraceus*, at Ben Weston Beach. Colony badly disturbed, if not eliminated, by removal of sand in construction of new Middle Ranch dam.

along Pacific coast: Isthmus, *M. E. Jones*, May 29, 1927; above Little Harbor on N side, 50 ft, *Thorne 34586*, May 11, 1965.

CLAYTONIA PERFOLIATA Donn [*Montia perfoliata* (Donn) Howell] Miner's-Lettuce. Common annual over island in moist, shaded gullies and canyon bottoms and slopes, 100–1400 ft: Renton Mine, Avalon, Gallagher's, Bulrush, and Cottonwood Canyons, Hay Press area, Moonstone Cove, S slope Mt. Orizaba, Fourth of July Cove, Cherry Valley.

**PORTULACA OLERACEA* L. Purslane. Cosmopolitan weedy annual found only once in disturbed ground near dam, Middle Ranch, 650 ft, *Thorne 36282*, Apr. 29, 1966.

PRIMULACEAE

**ANAGALLIS ARVENSIS* L. subsp. *ARVENSIS*. Scarlet Pimpernel, Poor Man's Weather-Glass. Common Eurasian weedy annual over island on sandy, silty, or gravelly stream bottoms, grassy slopes, and disturbed places, 6–1400 ft: Renton Mine, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, and Bulrush Canyons, Moonstone Cove, S slope Mt. Orizaba, Ben Weston Beach, Empire Landing, Howland's Landing.

DODECATHEON CLEVELANDII Greene subsp. *INSULARE* H. J. Thomps. Shooting Star. Frequent perennial on grassy, clayey slopes, mostly on Channel slope, 100–1600 ft: Wrigley Drive, Avalon, Hamilton, Gallagher's and Bulrush Canyons, NW slope Black Jack Mt., ridge between Cottonwood Canyon and Little Harbor, Isthmus, Cherry Valley.

RANUNCULACEAE

CLEMATIS LIGUSTICIFOLIA Nutt. in T. & G. Virgin's Bower. Infrequent vine climbing over shrubs and trees along streams and in gullies of SE half of island, 100–900 ft: Hamilton, Middle Ranch, and Cottonwood Canyons, W slope Mt. Orizaba in gully.

DELPHINIUM PARRYI A. Gray subsp. *PARRYI* [inc. *D. hesperium* of Millsp. & Nutt.] Larkspur. Infrequent perennial of grassy, clayey or rocky slopes of Channel slope, 25–1500 ft: Pebbly Beach, Avalon, and Gallagher's Canyons, Hay Press area, N slope Black Jack Mt., above Emerald Bay.

RANUNCULUS HEBECARPUS H. & A. Buttercup. Infrequent slender annual of moist, shaded canyon bottoms and slopes of Channel slope, 100–1400 ft: Renton Mine, Hamilton and Gallagher's Canyons, Hay Press area, Cherry Valley.

RESEDACEAE

OLIGOMERIS LINIFOLIA (Vahl) Macbr. [*O. glaucescens* Cambess.] Mignonette. Infrequent annual of Pacific slope on sea-bluffs and dry, rocky canyon slopes, 50–700 ft: Fern Canyon, about 700 ft, May 31, 1966; Cottonwood Canyon, 350 ft, *Thorne 35868*, Apr. 5, 1966; Little Harbor, 50 ft, *Thorne 34576*, May 11, 1965; bluff SE of Catalina Harbor, Isthmus, 300 ft, *Thorne 35753*, Apr. 4, 1966.

**RESEDA ODORATA* L. Mignonette. Garden annual not recently collected, but according to Millspaugh and Nuttall, "A Mediterranean and garden species plentifully established at various points on the grassy slopes of Avalon, Descanso and Hamilton Canyons. March to May." It apparently has not survived long out of cultivation.

RHAMNACEAE

CEANOTHUS ARBOREUS Greene. California-lilac. Frequent small tree or large shrub on Channel slope in wooded canyon bottoms and slopes, 60–1800 ft: Pebbly Beach, Big Wash, Hamilton, Swain's, and Grand Canyons, Farnsworth Spring on Summit Road, slopes of Black Jack and Orizaba Mts., Fourth of July Cove, Cherry Valley, ridge between Howland's and Johnson's Canyons. This insular endemic, known otherwise from only Santa Cruz and Santa Rosa Islands, reaches heights of 12–15 ft with trunks 6–12 inches DBH.

CEANOTHUS MEGACARPUS Nutt. subsp. *INSULARIS* (Eastw.) Raven [inc. *C. crassifolius* of Millsp. & Nutt.] White-lilac. Frequent chaparral shrub, rarely a small tree, of E half of island on dry, rocky slopes and ridges in rocky clay soil, mostly at higher elevations, 400–1600 ft: East Mt., Pacific Divide, Avalon Canyon, Salta Verde, upper Cape Canyon, slopes of Black Jack Mt., upper Swain's Canyon, and E of Catalina Airport. The Santa Catalina and San Clemente Island plants of *C. megacarpus* seem to represent a hybrid swarm between the two subspecies. Generally the leaves are closer in size to the subsp. *insularis* but mostly alternate

in arrangement like the mainland subsp. *megacarpus*. The capsules vary from conspicuously horned *megacarpus* types to almost hornless *insularis* types. Possibly the plants on the slopes of Black Jack Mt. favor subsp. *insularis* characteristics somewhat more than those from farther E on Catalina.

RHAMNUS PIRIFOLIA Greene [*R. insulus* Kell.] Wild-coffee, Island Buckthorn. Common large shrub or small tree, mostly on Channel slope in chaparral or woodland on rocky canyon slopes and ridges, 30–1400 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, Bulrush, and Grand Canyons, Hay Press area, above Empire Landing, Fourth of July Cove, Cherry Valley, Howland's Landing. This species appears to be distinct from *R. crocea* Nutt. in T. & G. and is restricted to the Channel Islands.

ROSACEAE

ADENOSTOMA FASCICULATUM H. & A. Chamise, Greasewood. Common chaparral shrub, or rarely a small tree, mostly on Channel slope on dry, rocky clay slopes and ridges, 60–1600 ft: East Mt., Avalon, Hamilton, Gallagher's, Swain's, Middle Ranch, and Bulrush Canyons, Buttonshell, slopes of Black Jack Mt., Ironwood Gully at Isthmus, Fourth of July Cove.

ALCHEMILLA OCCIDENTALIS Nutt. [*Aphanes cuneifolia* (Nutt.) Rydb.] Infrequent, inconspicuous small annual of SE third of island on grassy, shaded banks or dry, eroded, clayey hillsides, 150–1500 ft: Renton Mine, lower Pebbly Beach, Hamilton, Gallagher's, and Toyon Canyons, Hay Press area.

CERCOCARPUS BETULOIDES Nutt. ex T. & G. var. **BLANCHEAE** (C. K. Schneid.) Little [*C. alnifolius* Rydb.] Mountain-mahogany, Hardtack. Common small tree or large shrub of wooded parts of the island in chaparral or woodland, mostly on Channel slope, in canyon bottoms or slopes in rocky clay or loam soil or alluvial wash, 30–1600 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Bulrush, and Grand Canyons, Moonstone Cove, Hay Press area, slopes of Black Jack and Orizaba Mts., Cherry Valley, Johnson's Canyon. The largest specimens are trees 25–30 ft tall with trunks 8 inches to 1 ft DBH. This race of *C. betuloides* is apparently found on Santa Catalina, Santa Cruz and Santa Rosa Islands and also in the Santa Monica Mts. and Lompoc area of Santa Barbara County, according to Mrs. Karen Searcy of U.C.L.A. Possibly this taxon would be better treated as a subspecies.

CERCOCARPUS TRASKIAE Eastw. Catalina-mahogany. A small tree with leaves coriaceous and often nearly entire, upper surface with impressed veins, and lower surface densely gray-tomentose, known apparently only from one arroyo on the Salta Verde, where collected originally by Blanche Trask and more recently by R. Moran 678 on rocks 1 m above the bottom of a wash, 250 m, Mar. 5, 1941 (LAM) and by R. F. Thorne 36735, 36736, and 36737, D. Propst, R. Rollins, and R. Carolin, in dry arroyo about 1 mile WNW of Salta Verde Pt., 550–650 ft, Mar. 18, 1967. We have now found trees of this distinctive endemic, each in bloom and one still bearing many fruits from last year's flowering. This arroyo, which I choose to call Wild Boar Gully in honor of the angry tusker who charged but missed me, is probably the same one in which Trask and Moran collected their material. We hope to establish the species at the Rancho Santa Ana Botanic Garden from the fruits collected in March.

HETEROMELES ARBUTIFOLIA (Lindl.) M. Roem. [*Photinia arbutifolia* Lindl., *H. arbutifolia* var. *macrocarpa* (Munz) Munz] Christmas Berry, Toyon. Common small tree of wooded parts of island in chaparral and oak woodland in canyons, on mountain sides, and on bluffs, 6–1600 ft: East Mt., Salta Verde, Pebbly Beach, Avalon, Gallagher's, Swain's, Middle Ranch, Bulrush, and Cottonwood Canyons, Moonstone Cove, slopes of Black Jack and Orizaba Mts., above Empire Landing, Isthmus, Cherry Valley, Parsons' Landing. The largest specimens on the island are trees 20–30 ft tall and up to 1 ft DBH. In general the island specimens do seem to have larger fruit and possibly merit the varietal recognition sometimes accorded them. Yellow fruited specimens are sometimes found: as a tree in Avalon, Thorne 36906, May 20, 1967.

HOLODISCUS DISCOLOR (Pursh) Maxim. var. **FRANCISCANUS** (Rydb.) Jeps. [*Sericotheca franciscana* Rydb.] Ocean Spray, Cream Bush. Rare shrub, just recently rediscovered on the island in upper Descanso Canyon by Doug Propst, forming large clump in moist spot along stream, Apr. 13, 1967; right fork, wall of Gallagher's Canyon, Fosberg S5436, July 16, 1931 (POM, LAM). Careful search of both main forks of Gallagher's Canyon failed to produce a trace of this plant, which may there be a victim of the severe goat depredation prevailing in the area.

LYONOTHAMNUS FLORIBUNDUS A. Gray subsp. *FLORIBUNDUS*. Catalina Ironwood. An endemic subspecies on Santa Catalina, this handsome slender-crowned tree is frequent in groves of a dozen to 100 or more trees in canyons and on mountain slopes, mostly of the Channel slope, from Gallagher's and Bulrush Canyons to West Peak, 250–1700 ft: Gallagher's, Toyon (Banning's), Swain's, and lower Bulrush Canyons, E slope of Black Jack Mt., Ironwood Gully (type locality) at the Isthmus, W of the Lion's Head, Johnson's Canyon, and N side West Peak. The trees range from 20–50 ft tall and up to 18 inches DBH. In more goat-ridden areas, as on West Peak, many of the trees are dead or dying from exposure of roots through erosion. We have observed no seedlings on the island. The Santa Catalina subspecies has evergreen, opposite, entire leaves with only occasional tendency in some leaves toward dissection. We found no evidence at all on Santa Catalina of the pinnate-pinnatifid-leaved subsp. *asplenifolius* (Greene) Raven found on San Clemente, Santa Cruz, and Santa Rosa Islands. The seedling leaves of subsp. *floribundus* are dissected like those of subsp. *asplenifolius*, and the two subspecies hybridize freely at the Rancho Santa Ana Botanic Garden. Because of the seedling leaves, the ample Miocene fossil record on the mainland of California and Nevada of subsp. *asplenifolius*, and the more restricted present range of subsp. *floribundus*, it seems quite likely that the Catalina Ironwood is derivative from subsp. *asplenifolius*. Both subspecies of this beautiful, stringy-barked insular endemic should be much more widely cultivated in warm, coastal areas of southern California. Both grow very rapidly at the Rancho. (Figs. 1, 9, 12).

POTENTILLA GLANDULOSA Lindl. subsp. *GLANDULOSA* [*Drymocallis glandulosa* (Lindl.) Rydb.] I found this perennial herb only in a dry stream bed in the upper part of Middle Ranch Canyon, 900 ft, *Thorne* 34963, June 23, 1965. Millsbaugh and Nuttall report it also from a branch ravine of Avalon Canyon.

PRUNUS ILICIFOLIA (Nutt. ex H. & A.) Walp. subsp. *LYONII* (Eastw.) Raven [*Laurocerasus Lyoni* (Eastw.) Britt. and probably *L. ilicifolia* of Millsp. & Nutt.] Catalina Cherry. Common handsome tree with dark green, shiny, evergreen leaves, often forming large groves in canyons on Channel slope, 15–1400 ft: Renton Mine, Avalon, Gallagher's, Swain's, Cape, and Bulrush Canyons, Moonstone Cove, slopes of Black Jack and Orizaba Mts., Cherry Valley, Parsons' Landing. The larger trees observed were 25–30 ft tall and up to 9–10 inches DBH. No trace of the mainland subsp. *ilicifolia* was found on the island although the two subspecies hybridize freely at the Rancho Santa Ana Botanic Garden and I have observed trees of subsp. *ilicifolia* that approach subsp. *lyonii* in size and foliage. Catalina Cherry is indigenous on San Clemente, Santa Cruz, and Santa Rosa Islands and is reported from San Julio Canyon of the Sierra Giganta of Baja California (Brandege, 1889).

**PRUNUS PERSICA* Batsch. Peach. This small Asiatic tree was found as a shrubby volunteer below road NW of Parsons' Landing, 500 ft, *Thorne* 36684, Sept. 15, 1966.

ROSA CALIFORNICA Cham. & Schlecht. Wild Rose. Infrequent shrub in moist canyon bottoms, usually near streams, on SE third of island, 100–1000 ft: Hamilton, Gallagher's, Cape, Middle Ranch, and Bulrush Canyons.

**RUBUS PROCERUS* P. J. Muell. Himalaya Berry. European shrub not recently collected: Pebbly Beach Canyon in sun on clay soil half way up to Mexican houses, 200 ft, *Wolf* 3469, May 9, 1932.

RUBUS URSINUS Cham. & Schlecht. [*R. vitifolius* of Millsp. & Nutt.] California Blackberry, Bramble. Infrequent scrambling or sprawling shrub in moist canyon bottoms of SE third of island, 180–1000 ft: Pebbly Beach, Avalon, Middle Ranch, and Bulrush Canyons.

RUBIACEAE

GALIUM ANGUSTIFOLIUM Nutt. in T. & G. [incl. *G. siccatum* Wright] Bedstraw. Frequent subshrub of coastal sage scrub and chaparral on dry, rocky slopes and ridges of SE half of island, 25–1200 ft: Renton Mine ridge, Pebbly Beach, Avalon, Hamilton, Gallagher's, Swain's, Middle Ranch, Cottonwood, and Fern Canyons.

**GALIUM APARINE* L. Common sprawling annual Eurasian weed over island in shaded places, 100–1600 ft: Renton Mine, Hamilton, Gallagher's, and Middle Ranch Canyons, Moonstone Cove, S slope Mt. Orizaba, Little Harbor, Cherry Valley, Parsons' Landing.

GALIUM CATALINENSE A. Gray. Catalina Bedstraw. Common perennial about island on

coastal bluffs, less common inland on rocky canyon slopes, 15–1400 ft: Jewfish Point, Avalon Bay, mouth of Gallagher's Canyon, E slope Black Jack Mt., below Eagle's Nest in Middle Ranch Canyon, Cottonwood Canyon, Shark Harbor, Isthmus, Fourth of July Cove, Parsons' Landing. This island endemic is also found on San Clemente Island.

GALIUM NUTTALLII A. Gray var. *NUTTALLII* [probably *G. miguelense* of Millsp. & Nutt.] Infrequent suffrutescent perennial about island on dry rocky slopes and ridges in coastal sage scrub and chaparral, 60–1400 ft: Avalon Canyon, E slope Black Jack Mt. at head of Swain's Canyon, ridge above Eagle's Nest, Cottonwood Canyon, between Cherry Valley and Johnson's Landing, Howland's Landing.

RUTACEAE

**RUTA CHALAPENSIS* L. [*R. graveolens* of Millsp. & Nutt.] Rue. Rare Mediterranean perennial escape, not recently collected on Santa Catalina: Avalon, J. I. Carlson, May 10, 1918 (US).

SALICACEAE

POPULUS FREMONTII S. Wats. Cottonwood. This tree occurs in some abundance only along the stream in the lower portion of Cottonwood Canyon, about 100 ft: at bridge on Isthmus Road, Fosberg S4830, May 7, 1931 (LAM); Wolf 3603, May 12, 1932; Thorne 35877, April 5, 1966.

POPULUS TRICHOCARPA T. & G. Black Cottonwood. Frequent large tree along streams in canyons of SE half of island, 50–600 ft: Pebbly Beach, Gallagher's, Toyon (all girdled and dead), Swain's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons. The largest trees I saw were 2–3 ft DBH and perhaps 50–60 ft tall; Millsbaugh and Nuttall report a Jepson specimen noting "largest tree 65 feet high with a trunk 10 feet 6 inches in diameter [circumference?]" from Swain's Canyon.

SALIX HINDSIANA Benth. var. *HINDSIANA* [*S. argophylla* of Millsp. & Nutt.] Sandbar Willow. Rare shrub, apparently collected only once: Big Wash Canyon, Nuttall 343, June 16, 1920 (F).

SALIX LAEVIGATA Bebb. Red Willow. Infrequent tree along streams in canyons of SE third of island, 200–600 ft: Cape, Middle Ranch, and Grand Canyons. The largest tree noted was 35 ft tall and 18 inches DBH.

SALIX LASIOLEPIS Benth. Arroyo Willow. Common shrub or small tree along streams in canyons of SE half of island, 20–800 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, Middle Ranch, Bulrush, and Fern Canyons, Ben Weston Beach.

SAURURACEAE

ANEMOPSIS CALIFORNICA Hook. Yerba Mansa. Rare glaucous perennial herb along small streams, 100–1450 ft: stream in Little Springs Canyon along Isthmus Road $\frac{1}{4}$ mile from Little Harbor, 100 ft, Wolf 3587, May 12, 1932; along Cottonwood Creek below dam in Cottonwood Canyon, 350 ft, Thorne 35857, Apr. 5, 1966; along small stream running into lower Buffalo Springs Reservoir, 1450 ft, Thorne 35905, Apr. 6, 1966, and 36528, June 2, 1966.

SAXIFRAGACEAE

JEPSONIA MALVIFOLIA (Greene) Small [*J. neonuttalliana* Millsp.] Insular endemic, perennial from cormlike rhizomes, rarely collected because of the ephemeral vernal leaves and autumnal scapes; scattered over Channel slope on dry, open slopes and ridges, 100–500 ft: ridge S side Avalon Valley above Avalon Terrace in oak woodland, 500 ft, Blakley 5546, Apr. 8, 1963 (SBBG); Empire Landing, D. Meadows, Nov. 12, 1927. Reported also from Lookout Point ridge, bluffs between Pebbly Beach and Avalon Bay, and Fisherman's Cove. Known elsewhere from Guadalupe, San Clemente, San Nicolas, Santa Cruz and Santa Rosa Islands.

LITHOPHRAGMA AFFINE A. Gray subsp. *MIXTUM* R. L. Taylor. [*Lithophragma catalinae* Rydb.] Woodland Star. Rare perennial herb with slender bulblet-bearing rhizomes on grassy, shaded slopes of SE third of Catalina: head of Pebbly Beach Canyon near Renton Mine, 900 ft, Dunkle 1868, Apr. 21, 1928, and Fosberg S4581, Apr. 13, 1931; Banning's Canyon, Dunkle 2124, Apr. 13, 1929 (LAM); Middle Ranch Canyon, 300 m, Moran 682, Mar. 6, 1941 (LAM). Reported by Millsbaugh and Nuttall also from Golf Links, Descanso, and Silver Canyons.

RISES VIBURNIFOLIUM A. Gray. Catalina Currant. Common sprawling or pendulous evergreen shrub on shaded slopes and banks, mostly on Channel slope, 90–1500 ft: near East Mt.,

Pebble Beach, Avalon, Gallagher's, Banning's, and Bulrush Canyons, Hay Press area, E slope Black Jack Mt., at and between Fourth of July Cove and Cherry Valley, Johnson's Valley, N of West Peak. This remarkable and beautiful plant, ideal for shaded banks, is known elsewhere only from All Saints Bay, Baja California.

SCROPHULARIACEAE

ANTIRRHINUM KELLOGGII Greene [*A. Hookerianum* Pennell] Rare annual collected on S slope of Black Jack Mt. below summit, 1600 ft, in chaparral, *Thorne* 34446, May 10, 1965. Reported by Millspaugh and Nuttall also from Avalon vicinity, Pebble Beach Canyon, Equestrian Trail, and Moonstone Beach.

ANTIRRHINUM NUTTALLIANUM Benth. in DC. Wild Snapdragon. Frequent annual or biennial of dry, rocky or eroded clayey slopes over island in coastal sage scrub and chaparral, 30-700 ft: Renton Mine, Avalon, Hamilton, Gallagher's, Swain's, and Cottonwood Canyons, Fourth of July Cove, Cherry Valley.

CASTILLEJA AFFINIS H. & A. [*C. Douglasii* Benth. in DC.] Indian Paint Brush. Common perennial from somewhat woody base on dry, rocky or clayey slopes over island, often in coastal sage scrub or chaparral, 30-1200 ft: Pebble Beach, Avalon, Hamilton, Middle Ranch, and Cottonwood Canyons, Farnsworth Spring, Little Harbor, Isthmus Cove, Cherry Valley, above Emerald Bay.

CASTILLEJA FOLIOLOSA H. & A. Frequent suffrutescent, white-tomentose perennial of dry, rocky or clayey canyon slopes and sea-bluffs of Channel slope on SE half of island, often in coastal sage scrub or chaparral, 25-1350 ft: Lookout Point, Pebble Beach, Avalon, Hamilton, Toyon, and Middle Ranch Canyons, N slope Black Jack Mt., above Empire Landing.

GALVESIA SPECIOSA (Nutt.) A. Gray [*Gambelia speciosa* Nutt.] Infrequent arching or pendulous shrub on rocky sea-bluffs of Channel slope, 10-90 ft: Moonstone Cove, White's Landing, Isthmus, and Johnson's Landing. This insular endemic is known also from Guadalupe Island and San Clemente Island, where it is much more abundant hanging from canyon walls as well as from sea-bluffs. (Fig. 19).

**LINARIA BIPARTITA* Willd. Rare escape from cultivation, this Mediterranean garden annual was collected once at mouth of Big Wash Canyon, S of Avalon, at edge of cultivated field, 20 m, *Fosberg* 8131.

LINARIA CANADENSIS L. var. *TEXANA* (Scheele) Penn. Blue Toadflax. Frequent annual over island on dry, rocky or clayey, bare or grassy slopes and sandy stream beds, 6-900 ft: Wrigley Drive above Pebble Beach, mouth of Hamilton Canyon, White's Landing, Cape and Middle Ranch Canyons, Salta Verde, W of Empire Landing, Johnson's Valley.

MIMULUS CARDINALIS Dougl. ex Benth. Red Monkey Flower. Frequent, and often locally abundant, scarlet-flowered annual along streams in canyons of SE half of island, 50-1000 ft: Hamilton, Toyon, Sweetwater, Swain's, Cape, Middle Ranch, Grand, Fern, and Cottonwood Canyons.

MIMULUS FLORIBUNDUS Dougl. ex Lindl. var. *FLORIBUNDUS*. Rare annual along streams in several canyons, 750-1100 ft: observed in Cape Canyon Reservoir, June 1, 1966; Fern Canyon, *Thorne* 36414, May 31, 1966; right fork Cottonwood Canyon, *Fosberg* S4845, May 7, 1931. Reported by Millspaugh and Nuttall also from left fork of Gallagher's Canyon.

MIMULUS GUTTATUS Fisch. ex DC. subsp. *GUTTATUS*. Yellow Monkey Flower. Rare herbaceous perennial often rooting at the nodes and with stolons: seeps between rocks, Grand Canyon below falls, 100 m, *Fosberg* 8146, May 7, 1932; clear water of stream bed in upper Middle Ranch Canyon below small reservoir, 900 ft, *Thorne* 36300, Apr. 29, 1966.

MIMULUS PUNICEUS (Nutt.) Steud. [*Diplacus linearis* of Millsp. & Nutt.] Sticky or Bush Monkey Flower. Red to orange-yellow flowered shrub common over island in chaparral and coastal sage scrub on dry, rocky or clayey slopes, bluffs, and washes, 6-1600 ft: East Mt., Pebble Beach, Avalon, Swain's, Middle Ranch, Bulrush, and Grand Canyons, Hamilton Canyon beach, slopes of Black Jack and Orizaba Mts., between Cherry Valley and Johnson's Landing. According to McMin (1951) most of the Santa Catalina plants "appear to represent polymorphous entities intermediate in character between *D. australis* [hairless *M. longiflorus* (Nutt.) Grant/ and *D. puniceus*," "hybrid swarms which have probably resulted from the crossing and back-crossing" of these two species. This is an all too familiar story on the island repeated in *Opuntia*, *Quercus*, and *Ceanothus* among other genera. If "pure" *M. longiflorus*

once occurred on Santa Catalina, it apparently has been "swamped out."

MIMULUS TRASKIAE A. L. Grant. Very rare endemic annual known only from the type collection: "one locality under shade, flowers white to wine color," *Trask*, Mar. 1901 (holotype, US); "one locality, 1-6 inches tall, flowers white stained with wine color," *Trask*, Mar. 1901 (isotype, LAM). The exact type locality on Santa Catalina is apparently not known.

ORTHOCARPUS PURPURASCENS Benth. Owl's-clover. Frequent annual of grassy slopes and ridges on Channel slope, 60-800 ft: Avalon, Hamilton, Bulrush, and Cottonwood Canyons, between Cherry Valley and Howland's Landing, Parsons' Landing.

PENSTEMON CORDIFOLIUS Benth. Coral Vine. Common scrambling shrub of canyon washes and slopes and coastal bluffs, mostly on Channel slope in chaparral and coastal sage scrub, 60-1500 ft: Renton Mine, Avalon, Gallagher's, Toyon, Swain's, Cape, Middle Ranch, Grand, and Orizaba Canyons, Moonstone Cove, E slope Black Jack Mt., Isthmus, between Cherry Valley and Howland's Landing, Johnson's Landing.

SCROPHULARIA VILLOSA Penn. in Millsp. & Nutt. Figwort. Tall perennial insular endemic frequent on wooded, brushy, or open canyon slopes and bottoms, mostly in chaparral or coastal sage scrub on Channel slope, 30-1400 ft: Renton Mine, Pebbly Beach Canyon, Avalon Valley, Hay Press area, near Empire Landing, Isthmus, Cherry Valley, Johnson's Valley. This species otherwise is found only on San Clemente Island where it is very rare.

SOLANACEAE

DATURA WRIGHTII Regel [*D. meteloides* of Millsp. & Nutt.] Jimson-weed. Rare bushy perennial of open, weedy places about island, 6-650 ft: dry, sandy, open fields S of Avalon golf course in Avalon Canyon, 300 ft, *Thorne* 34929, June 22, 1965; weedy margin of reservoir, Middle Ranch, 650 ft, *Thorne* 36632, Sept. 14, 1966; pebble flat at Fourth of July Bay, 2 m, *Fosberg* S4928, May 21, 1931 (LAM). This species is said to have been used by the Chumash Indian inhabitants of the island in their religious rites (Overholt, 1962; Doran, 1963).

LYCIUM CALIFORNICUM Nutt. ex A. Gray. Box Thorn. Abundant, low, densely branched shrub all along Pacific coast on sea-bluffs and headlands and dry, rocky slopes, banks, and ridges, 10-550 ft: Salta Verde, Ben Weston Beach, below Eagle's Nest, Cottonwood Canyon and beach, Indian Head Point, Little Harbor, Catalina Harbor, Isthmus Cove.

LYCIUM HASSEI Greene [*L. Richii* of Millsp. & Nutt.] The one known specimen on the island, "a single large clump in Avalon: 25 ft high and 100 ft in circumference," *Trask*, Apr., 1896 (US); *Brandegee*, May, 1889; and A. Davidson, June 25, 1891 (LAM); was destroyed in 1908 "to make way for buildings." Apparently the only other specimen known of this island endemic was "one small tree, with swollen trunk" (Raven, 1963) at Northwest Harbor, San Clemente Island, which was dead by 1936. It seems probable, therefore, that this species is extinct as a native plant.

NICOTIANA BIGELOVII (Torr.) S. Wats. Wild Tobacco. Rare ill-smelling annual collected on rocky slope by new road along East Mountain, 1500 ft, *Thorne* 34883, June 22, 1965. Millspaugh and Nuttall report it also from Pebbly Beach Road and Canyon.

**NICOTIANA GLAUCA* Grah. Tree Tobacco. A common South American shrub over island in canyon bottoms, gullies, fields, on bluffs, rocky slopes, and talus and in disturbed places generally, 15-1600 ft: Jewfish Point, Pebbly Beach, Avalon, Gallagher's, Swain's, Middle Ranch, and Cottonwood Canyons, slopes of Black Jack and Orizaba Mts., Ben Weston Beach, above Empire Landing, Isthmus, Parsons' Landing.

SOLANUM DOUGLASII Dunal in DC. Nightshade. Common suffrutescent perennial over island in canyons and gullies, dunes, salinas, roadbanks, and weedy places, 10-1600 ft: Renton Mine, Avalon, Hamilton, Middle Ranch, and Cottonwood Canyons, White's Landing, slopes of Black Jack and Orizaba Mts., Ben Weston Beach, Little Harbor, quarry above Empire Landing, Isthmus, Parsons' Landing.

**SOLANUM ELEAGNIFOLIUM* Cav. Silverleaf-nettle. Perennial weed from central North America heavily established near corral at riding stables in Avalon, 50 ft, *Thorne* 36693, Sept. 16, 1966.

SOLANUM WALLACEI (A. Gray) Parish. Wild-tomato. Frequent suffrutescent or shrubby perennial endemic to SE half of island on rocky banks and slopes, in washes, and along dry stream beds in canyons, 10-1350 ft: Pebbly Beach, Avalon, Big Wash, Hamilton, Swain's,

Cape, and Middle Ranch Canyons, E slope Black Jack Mt., Hay Press area. The large, blue flowers, large densely tawny-villous leaves, shrubby, sprawling habit, and large, purple-black, poisonous berries make this a conspicuous and distinctive plant indeed. The populations known as *S. wallacei* var. *clokeyi* (Munz) McMinn on Santa Cruz and Santa Rosa Islands have foliage that is less viscid and tawny, smaller corollas, 1.5–2 cm broad, and yellow berries 1–1.5 cm in diameter. This latter taxon is better treated as a distinct species, *S. clokeyi* Munz, endemic on the two islands.

TROPAEOLACEAE

**TROPAEOLUM MAJUS* L. Garden-nasturtium. This Peruvian garden annual is well established on bluffs about Avalon Bay and perhaps at other points along the Channel coast: observed along road between Hamilton Canyon and Avalon, June 23, 1965; rocky slope S of Lookout Point, 100 ft, *Thorne 34867*, June 22, 1965.

URTICACEAE

HEPEROCNIDE TENELLA Torr. Coast Nettle. Infrequent annual of shaded, moist canyon floors and slopes, mostly on Channel slope, 90–850 ft: Renton Mine, Hamilton, Gallagher's, and Cape Canyons, Fourth of July Cove, Cherry Valley.

PARIETARIA FLORIDANA Nutt. [*P. debilis* of Millsp. & Nutt.] Pellitory. Frequent slender annual in shaded places in canyons, gullies, among boulders and talus, and on sea-cliffs, mostly on Channel slope, 30–1600 ft: Jewfish Point, Renton Mine, Hamilton, Gallagher's, Toyon, Middle Ranch, and Bulrush Canyons, White's Landing, Cherry Valley, Parsons' Landing.

URTICA DIOICA L. subsp. *holosericea* (Nutt.) comb. nov. [based on *U. holosericea* Nutt. J. Philad. Acad. n. s. 1: 183 (1847)] Tall Nettle. Frequent tall perennial stinging nettle of SE half of island along streams in canyon bottoms, 100–1050 ft: Toyon, Sweetwater, Swain's, Cape, Middle Ranch, Cottonwood, and Fern Canyons. The American perennial nettles seem most realistically treated as geographic races, i. e. subspecies, of the circum-temperate dioecious species.

**URTICA URENS* L. Stinging Nettle. Infrequent, heavily armed, European annual weed of shaded, usually disturbed places, 100–900 ft: Avalon, Cape, Fern, and Cottonwood Canyons, Cherry Valley.

VALERIANACEAE

**CENTRANTHUS RUBER* (L.) DC. Red Valerian. Red, pink, or white-flowered Eurasian-North African perennial abundantly and conspicuously established about Avalon on sea-bluffs from Pebbly Beach to Hamilton Canyon and on the rocky slopes along the Summit Road W of Avalon, 10–600 ft.

VERBENACEAE

**LIPPIA NODIFLORA* Michx. var. *ROSEA* (D. Don) Munz. Capeweed. Matted, South American perennial formerly established at Avalon but not recently collected: cliffs overlooking sea, Avalon, *Fosberg S5414*, July 14, 1931; hill N of Avalon, ocean bluff, 30 m, *Fosberg 8113*, May 5, 1932.

VERBENA BRACTEATA Lag. & Rodr. Vervain. Rare spreading annual or perennial on desiccated mud of ponds, 250–1350 ft: Echo Lake, *Fosberg S5403*, July 14, 1931; *Blakley 5394*, Oct. 31, 1962 (SBBG) and 5591, Apr. 10, 1963 (SBBG); *Thorne 36516*, June 2, 1966; small marshes above Parsons' Landing, *Thorne 36679*, Sept. 15, 1966.

VERBENA ROBUSTA Greene [*V. prostrata* of Millsp. & Nutt.] Frequent perennial along stream beds in canyons of SE half of island, 50–800 ft: Pebbly Beach, Hamilton, Toyon, Swain's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons.

VIOLACEAE

VIOLA PEDUNCULATA T. & G. Johnny Jump-up, Yellow Pansy. Infrequent perennial from short rhizome on Channel slope on grassy slopes in clayey loam or rocky clay soils, 500–1600 ft: ridges above Avalon, head of Gallagher's Canyon, NW slope Black Jack Mt., Bulrush Canyon, W of Empire Landing, Isthmus.

VITACEAE

VITIS GIRDIANA Munson. Wild Grape. Rare liana known from only two canyons: Pebbly Beach Canyon, right fork, over trees, *Fosberg* S4585, Apr. 13, 1931; Cottonwood Canyon, 650 ft, *Raven* 17813, May 21, 1962, and *Thorne* 36752, Mar. 18, 1967. Also listed by Millsbaugh and Nuttall from Rock Spring Canyon.

MONOCOTYLEDONEAE

CYPERACEAE

CAREX TRIQUETRA W. Boott. Sedge. Perennial from short rhizomes, rare on dry, grassy slopes: open meadows, one locality, *Trask*, Mar. 1901 (LAM); lower end of Bulrush Canyon, 650 ft, *Raven* 17813, May 21, 1962, and *Thorne* 36752, Mar. 18, 1967. Also listed by Millsbaugh and Nuttall from Rock Spring Canyon.

CAREX TUMULICOLA Mack. Rhizomatous perennial found only along small stream running into lower Buffalo Springs Reservoir, 1450 ft, *Thorne* 35902, Apr. 6, 1966.

ELEOCHARIS PALUSTRIS (L.) R. & S. Rhizomatous perennial, infrequent on reservoir and pond margins over island, 150–1400 ft: Hay Press Reservoir, swale near Toyon Picnic Ground, Echo Lake, No. 2 Reservoir in upper Middle Ranch Canyon, Cape Canyon reservoir, pond between Cottonwood Canyon and Little Harbor, depressions above Parsons' Landing near Arrow Point.

SCIRPUS MICROCARPUS Presl. Bulrush. Perennial with stout rhizomes found only in small marsh along and in shallow water of small stream in Middle Ranch Canyon SW of Eagle's Nest, 200–250 ft, *Thorne* 35809, Apr. 5, 1966, and 36296, Apr. 29, 1966.

SCIRPUS ROBUSTUS Pursh [*S. pacificus* Britt.] Rare perennial from horizontal tuberiferous rhizomes, not recently collected: black muck of creek-bed, NW beach at Little Harbor, *Nuttall* 816, ca. 1920 (US).

IRIDACEAE

SISYRINCHIUM BELLUM S. Wats. Blue-eyed-grass. Rare perennial of grassy slopes, collected recently only near road to Parsons' Landing, 300 ft, near Arrow Point, *Thorne* 35976, Apr. 7, 1966; without locality, open grassy slopes, rich soil, 100 ft, *Dunkle* 1744, Mar. 17, 1928. Also reported by Millsbaugh and Nuttall from bank of Avalon Run.

JUNCACEAE

JUNCUS ACUTUS L. var. *SPHAEROCARPUS* Engelm. [*J. robustus* S. Wats.] Rush, "Bulrush." Large tufted perennial, locally abundant, along lower reaches of small streams running mostly westward to Pacific coast, 50–125 ft: Bulrush Canyon, Cottonwood Canyon behind and below dam and behind beach, back of Shark Harbor beach, Big Springs and Little Springs Canyons near Little Harbor, Parsons' Landing.

JUNCUS BALTICUS Willd. Wire Rush. Perennial from creeping rhizome frequent over island along streams and near reservoirs, 15–1000 ft: Cape, Middle Ranch, Bulrush and Cottonwood Canyons, White's Landing, Little Harbor salina.

JUNCUS BUFONIUS L. Toad Rush. Infrequent annual over island along streams and on reservoir margins, 30–1450 ft: Cape, Fern, and Middle Ranch Canyons, lower Buffalo Springs Reservoir, soapstone quarries near Parsons' Landing.

JUNCUS XIPHIODES E. Mey. Rhizomatous perennial found only along stream in Middle Ranch where locally abundant from near No. 2 Reservoir, 1000 ft, to small desiccated marsh behind dunes at Ben Weston Beach, 10 ft.

LILIACEAE (incl. AMARYLLIDACEAE)

ALLIUM PENINSULARE Lemmon [prob. *A. serratum* of Millsp. & Nutt.] Wild Onion. Infrequent bulbiferous perennial of grassy slopes near the coast, 25–300 ft: N of Avalon, mouth of Gallagher's Canyon, Little Harbor, Isthmus Cove.

ALLIUM PRAECOX Bdg. Rare bulbiferous perennial not recently collected: Equestrian Trail back of Avalon, 800 ft, *Wolf* 3520, May 10, 1932; open valley 2 miles from Isthmus on road to Little Harbor, 300 ft, *Wolf* 3583, May 12, 1932.

**ASPARAGUS OFFICINALIS* L. Garden Asparagus. European perennial rarely escaped and not recently collected: canyon floor near Eagle's Nest, Middle Ranch Canyon, 180 m, *Fosberg* S5368, July 10, 1931 (LAM).

BLOOMERIA CROCEA (Torr.) Cov. var. *CROCEA*. Golden Stars. Perennial with corm, frequent on Channel slope in chaparral and coastal sage scrub and on grassy slopes, 100–1600 ft: Pebbly Beach, Avalon, Gallagher's, Swain's, Cape, and Middle Ranch Canyons, slopes of Black Jack and Orizaba Mts., Isthmus.

BRODIAEA JOLONENSIS Eastw. [*Hookera minor* of Millsp. & Nutt.] Perennial with corm, rare on clayey slopes of SE third of island, 800–1400 ft: Bulrush Canyon, *Thorne* 34625, May 12, 1965; Hay Press area, *Thorne* 36257, Apr. 28, 1966; near Cape Canyon Reservoir, *Thorne* 36491, June 1, 1966.

CALOCHORTUS CATALINAE S. Wats. Mariposa Lily. Common bulbiferous perennial over island on grassy slopes and bare ridges, 50–1600 ft: Lookout Point, Avalon, Gallagher's, Middle Ranch, and Bulrush Canyons, White's Landing, NW slope Black Jack Mt., Little Harbor, Isthmus, Howland's Landing.

CALOCHORTUS SPLENDENS Dougl. ex Benth. Frequent bulbiferous perennial of grassy or bare, eroded slopes and ridges over island, 50–1300 ft: Renton Pass, Sweetwater, Cape, Middle Ranch, and Cottonwood Canyons, SE slopes Black Jack Mt., Empire Landing, Isthmus, Johnson's Landing.

CHLOROGALUM POMERIDIANUM (DC.) Kunth. Soap Plant, Amole. Perennial from bulb, rare on dry, sparsely grassy, hard-packed, clayey slopes in the vicinity of Black Jack Mountain, 1100–1700 ft: observed at Cape Canyon Reservoir, June 1, 1966, and on E slope Black Jack Mt. in Swain's Canyon, Mar. 19, 1967; W slope Black Jack Mt., *Thorne* 35808, Apr. 4, 1966. Mentioned also by Millspaugh and Nuttall from near the mouth of Cholla Canyon.

DICHELOSTEMMA PULCHELLUM (Salisb.) Heller [*D. capitata* (Benth.) Wood, *Brodiaea pulchella* (Salisb.) Greene] Blue Dicks. Perennial from corm, common over island on dry, rocky slopes and ridges, often in coastal sage scrub and cactus clumps, 100–1350 ft: Hamilton, Middle Ranch, Bulrush, and Cottonwood Canyons, White's Landing, Hay Press area, Indian Head Point, above Empire Landing, Isthmus, Howland's Landing, Parsons' Landing.

ORCHIDACEAE

HABENARIA UNALASCHENSIS (Spreng.) S. Wats. Rein Orchid. Perennial with tuber-like roots, infrequent on dry, rocky-clay slopes, talus, or disturbed soil, 60–750 ft: Hamilton Canyon, 60 m, *Fosberg* S4568, Apr. 11, 1931 (LAM); sea-bluff at Hamilton Beach, 20 m, *Fosberg* S4495, Apr. 7, 1931 (LAM); Middle Ranch Canyon near mouth of Cape Canyon, 200 m, *Fosberg* S4867; slope ca. 2 mi from Rancho Escondido on road to airport, 750 ft, *Blakley* 5438, Oct. 5, 1962; just above Fourth of July Cove, 100 ft, *Raven* 17835, May 22, 1962; E slope Black Jack Mt., 1250 ft, *Thorne* 36884, May 19, 1967.

POACEAE (GRAMINEAE)

AGROSTIS DIEGOENSIS Vasey. Bent Grass. Frequent rhizomatous perennial of SE half of island on rocky, clay or eroded, bare slopes or bluffs, 15–1200 ft: bluff above Pebbly Beach Drive, Avalon, Fern, Middle Ranch, Bulrush, and Cottonwood Canyons, E slope Black Jack Mt., Little Harbor salina, Ironwood Gully S of Catalina Harbor at Isthmus.

**AGROSTIS STOLONIFERA* L. var. *MAJOR* (Gaud.) Farw. [*A. alba* of most authors] European stoloniferous perennial collected once in a sandy disturbed area behind Ben Weston Beach, 10 ft, *Thorne* 36643, Sept. 14, 1966; and observed near Bulrush Canyon and Silver Peak.

ANDROPOGON BARBINODIS Lag. [*A. saccharoides* of Millsp. & Nutt.] Beard Grass. Rare tufted perennial found in some abundance on dry, rocky hillsides above Pebbly Beach and along road to Renton Mine in same area, 100–850 ft: along Wrigley Drive, *Blakley* 5566, Apr. 9, 1963 (SBBG), and *Thorne* 34860, June 22, 1965; along road to Renton Mine, *Wolf* 4206, and *Thorne* 36196, Apr. 28, 1966. Reported by Millspaugh and Nuttall also between Cherry Valley and Howland's Landing.

ARISTIDA ADSCESSIONIS L. Three-awned Grass. Rare annual found only on a dry SSE-facing rocky slope at Cherry Valley, 200 ft, *Thorne* 35942, Apr. 7, 1966, and on Salta Verde, *Thorne* 36879, May 18, 1967, but reported by Millspaugh and Nuttall also from a clayey bank, Fourth of July Cove.

**AVENA BARBATA* Pott ex Link. Slender Wild Oat. Mediterranean annual weed abundantly established over island on dry, rocky, open slopes and ridges, 15–2000 ft: Renton Mine, Avalon, Gallagher's, Swain's, and Cottonwood Canyons, Moonstone Cove, Little Harbor, Isthmus, etc.

**AVENA FATUA* L. Wild Oat. Eurasian-North African annual weed established with, but not so abundant as, the preceding species over island on dry, rocky open slopes and ridges, 15–2000 ft: Renton Mine, Pebbly Beach, Avalon, Gallagher's, and Middle Ranch Canyons, Isthmus, etc.

**AVENA SATIVA* L. Cultivated Oat. European annual occasionally escaping from cultivation but probably not persisting: near temporary pool, Middle Ranch Canyon above ranch, 750 ft, *Thorne* 36271, Apr. 29, 1966.

**BRACHYPODIUM DISTACHYON* (L.) Beauv. Infrequent Eurasian annual on dry, rocky or grassy slopes and bluffs and sandy beaches along coast, 5–400 ft: near Lookout Point, Wrigley Drive, ridge between Moonstone and White Coves, Little Harbor, Isthmus, above Emerald Bay.

BROMUS ARIZONICUS (Shear) Stebbins. Brome. Annual grass collected once at edge of low thicket of *Lavatera*, etc. on Bird Rock, 25 ft, off Fisherman's Cove, *Thorne* 35789, Apr. 4, 1966.

BROMUS CARINATUS H. & A. Rare, usually perennial grass from S third of Catalina, 30–550 ft: cliffs near Jewish Point, 10 m, *Fosberg* S4571, Apr. 12, 1931 (LAM); dry open N slope of Bulrush Ridge, *Fosberg* S4646, Apr. 16, 1931 (LAM); creek bed in Middle Ranch Canyon below Eagle's Nest, 180 m, *Fosberg* S4608, Apr. 14, 1931 (POM, LAM).

**BROMUS DIANDRUS* Roth [*B. rigidus* and *B. rigidus Gussoni* of Millsp. & Nutt.] Ripgut Grass. Common Mediterranean annual weedy grass over island in open places, particularly along roadsides and in disturbed ground, 10–2000 ft: Pebbly Beach, Avalon, Gallagher's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons, Echo Lake, Orizaba Mt., Ben Weston Beach, Bird Rock.

BROMUS MARGINATUS Nees. Perennial collected above Pebbly Beach near rock crusher, in dust and silt from crusher, *Fosberg* S4484, Apr. 2, 1931 (LAM).

**BROMUS MOLLIS* L. [*B. hordeaceus* of Millsp. & Nutt.] Common Eurasian annual weed over island in dry, open grassy places, 6–2000 ft: Renton Mine, Pebbly Beach, ridge S of Avalon, Gallagher's, Swain's, Cape, and Bulrush Canyons, Little Harbor, Isthmus, Cherry Valley, Parsons' Landing, etc.

BROMUS PSEUDOLAEVITES Wagnon [*B. Orcuttianus* and *B. subvelutinus* of Millsp. & Nutt.] Infrequent perennial of dry, rocky bluffs near Avalon Bay, 25–200 ft: above Pebbly Beach, *Raven* 17772, May 20, 1962; along Pebbly Beach Drive, *Thorne* 36453, June 1, 1966; mouth of Descanso Canyon, *Thorne* 34984, June 23, 1965; mouth of Hamilton Canyon, *Fosberg* S4501, Apr. 7, 1931, and *Thorne* 34999, June 23, 1965.

**BROMUS RUBENS* L. Foxtail Cheat. Common Mediterranean annual weed over island on dry, rocky, open slopes and ridges and weedy places, 12–2000 ft: near East Peak, Pacific Divide, Pebbly Beach, Gallagher's, Swain's, and Cottonwood Canyons, White's Landing, Mt. Orizaba, Little Harbor, Bird Rock, Parsons' Landing, etc.

**BROMUS STERILIS* L. [*B. tectorum* of Millsp. & Nutt.] Rare Mediterranean annual weed established in Avalon vicinity, 100–800 ft: Pebbly Beach Canyon, *Nuttall* 1219, May 14, 1920; Golf Links Hollow, *Nuttall* 95 and 562, May 3, 1920 (F, US); Farnsworth Loop on Summit Road, *Raven* 17780, May 20, 1962.

BROMUS TRINII Desv. Very rare annual known only from one early collection: J. S. Brandegee 55, May 12, 1890 (US, UC).

**CATAPODIUM RIGIDUM* (L.) C. E. Hubbard [*Scleropoa rigida* (L.) Griseb.] Infrequent European annual weed scattered about island on clayey or disturbed soils, 15–750 ft: Descanso, Fern, and Middle Ranch Canyons, Echo Lake, Cherry Valley.

**CORTADERIA SELLOANA* (Schult.) A. & G. Pampas Grass. Large Argentine perennial tussock grass escaped from cultivation in storage area near dump beyond Lookout Point, *Thorne* 34870, June 22, 1965.

**CRYPISIS ACULEATA* (L.) Ait. [*C. niliaca* Fig. & De Not.?] Prostrate annual from

eastern Mediterranean established in abundance on desiccated muddy margin of Hay Press Reservoir, 1350 ft, *Thorne* 36712, Sept. 16, 1966; and Wrigley Reservoir, 1400 ft, *Blakley* 5377, Oct. 3, 1962 (SBBG).

**CYNODON DACTYLON* (L.) Pers. [*Capriola Dactylon* (L.) Ktze.] Bermuda Grass. Extensively creeping perennial with rhizomes and stolons, from warmer regions of the world, infrequent about the island on roadsides and disturbed, grassy areas, 25–1400 ft: Avalon Valley, between Hamilton and Descanso Canyons, Hay Press area, Moonstone Cove, above Goat Harbor.

**DACTYLIS GLOMERATA* L. Orchard Grass. Coarse tufted perennial grass from Eurasia–North Africa established in former lawn of razed St. Catherine's Hotel, Descanso Canyon, 15 ft, *Thorne* 36487, June 1, 1966.

DISSANTHELIUM CALIFORNICUM (Nutt.) Benth. Extremely rare, possibly extinct, succulent, apparently annual grass described in 1848 by Nuttall as *Stenochloa californica* from a Gambel collection from Santa Catalina Island. I have not seen this type collection. It has otherwise been collected more than a half century ago once each on San Clemente and Guadalupe Islands. Because of its succulence and attractiveness to goats (Palmer in Watson, 1876), it is very likely one of many species wiped out by these pernicious mammals that have been allowed to devastate the vegetation on all three islands.

DISTICHLIS SPICATA (L.) Greene var. *STOLONIFERA* Beetle. Salt Grass. Perennial from stout rhizomes, frequent along coast in salinas, beaches, and dunes, infrequent inland on reservoir or stream margins, 10–1100 ft: Pebbly Beach, Moonstone Cove, White's Landing, Cape, Middle Ranch, and Cottonwood Canyons, Ben Weston Beach, Little, Shark, and Catalina Harbors, Parsons' Landing.

**ECHINOCHLOA CRUS-GALLI* (L.) Beauv. Barnyard Grass. Weedy annual from warmer regions collected once as garden weed at Avalon, 25 ft, *Thorne* 36427, May 31, 1966.

**EHRRHARTA CALYCINA* J. E. Sm. Tufted perennial from South Africa sown and established in enclosure on grassy slope above lower end of Bulrush Canyon, 800 ft, *Thorne et al* 36741, Mar. 18, 1967. Collected also near airfield runway on San Clemente Island by M. A. Piehl 631117, Dec. 8, 1963 (SBBG).

ELYMUS CONDENSATUS Presl. Ryegrass. Tall, coarse, tufted perennial frequent over island in various habitats, especially canyon bottoms and slopes, along streams, and on roadsides, 10–1300 ft: Pebbly Beach, Hamilton, Toyon, Middle Ranch, and Cottonwood Canyons, Isthmus, Howland's Landing.

ELYMUS GLAUCUS Buckl. Infrequent tufted perennial of dry, sunny slopes, sometimes at edge of woodlands, and of canyon bottoms, 200–1000 ft: Pebbly Beach, Cape, and Middle Ranch Canyons, Hay Press area.

ELYMUS MULTISETUS (J. G. Sm.) Jones [*Sitanion jubatum* J. G. Sm.] Squirreltail. Caespitose perennial, apparently collected only once at head of Grand Canyon, *Nuttall* 314, June 8, 1920 (US).

ELYMUS TRITICOIDES Buckl. Perennial in large clumps from extensively creeping rhizomes, infrequent along streams in canyon bottoms on SE half of island, 10–900 ft: Swain's, Middle Ranch, and Cottonwood Canyons, and grassy flat behind Little Harbor.

FESTUCA MEGALURA Nutt. Common annual of dry, rocky or adobe slopes, bluffs, talus, and sandy stream beds, 50–1350 ft: Renton Mine, Avalon, Gallagher's, Fern, Cottonwood, Middle Ranch, and Bulrush Canyons, Hay Press Reservoir, Little Harbor, old quarry above Empire Landing.

**FESTUCA MYUROS* L. Rattail Fescue. Infrequent European annual of dry, clayey slopes and dry stream beds and margins, 40–1400 ft: Avalon, Gallagher's, Cape, and Fern Canyons, Isthmus.

FESTUCA OCTOFLORA Walt. Rare tufted annual of dry, rocky or eroded, clayey slopes: Rancho Escondido in Cottonwood Canyon, 700 ft, *Thorne* 35026, June 24, 1965; old quarry above Empire Landing, 300 ft, *Thorne* 35916, Apr. 6, 1966. Reported also by Millsbaugh and Nuttall from Avalon and Silver Canyons.

FESTUCA PACIFICA Piper. Infrequent annual of grassy or dry, rocky slopes, 50–850 ft: Renton Mine, Avalon, Hamilton, Gallagher's, and Fern Canyons, near Arrow Point above Parsons' Landing, Salta Verde.

**FESTUCA PRATENSIS* Huds. [*F. elatior* of authors, *F. arundinacea* Schreb.] Fescue. Large tufted perennial from Eurasia established in the former lawn of razed St. Catherine's Hotel, Descanso Canyon, 15 ft, *Thorne* 36488, June 1, 1966, and Bulrush Canyon, *Thorne* 36861, May 20, 1967.

FESTUCA REFLEXA Buckl. Rare annual: Salta Verde, *Thorne* 36865a, May 18, 1967; N slope near ocean between Cottonwood and Middle Ranch Canyons, 20 m, *Fosberg* S4728, 1931 (POM, LAM). Also reported by Millspaugh and Nuttall from Avalon and Rock Falls Canyons.

**GASTRIDIMUM VENTRICOSUM* (Gouan) Schinz & Thell. Nit Grass. Infrequent European annual of dry, rocky-clay or eroded clayey slopes and stream margins, 200–850 ft: Avalon, Hamilton, and Fern Canyons, Salta Verde, Isthmus.

HORDEUM CALIFORNICUM Covas & Steb. Barley Grass. Tufted perennial found only in the desiccated pools of the soapstone quarries above Parsons' Landing, 250 ft: *Fosberg* S4945, May 21, 1931 (LAM); *Thorne* 36681, Sept. 15, 1966.

**HORDEUM GLAUCUM* Steud. [*H. murinum* of Millsp. & Nutt., in part] Foxtail, Squirrel Grass. Common, and often abundant, Mediterranean annual weed over island in various habitats, especially desiccated clay of reservoir and pond margins, rocky ridges, and disturbed ground, 10–1400 ft: Avalon, upper Gallagher's, and Middle Ranch Canyons, Echo Lake, Ben Weston Beach, W slope Mt. Orizaba, Isthmus, Bird Rock.

**HORDEUM HYSTRIX* Roth. [*H. nodosum* of Millsp. & Nutt.] Rare European annual of saline places along coast, 5–15 ft: salina at Little Harbor, *Thorne* 34557, May 11, 1965; foot of beach bluff at Parsons' Landing, *Thorne* 35984, Apr. 7, 1966. Also listed by Millspaugh and Nuttall from former salina at Pebbly Beach.

**HORDEUM LEPORINUM* Link [*H. murinum* of Millsp. & Nutt., in part] Foxtail Barley. Mediterranean weedy annual apparently less common about island than the very closely related *H. glaucum*, 30–650 ft: Hamilton Canyon, Middle Ranch, Isthmus.

HORDEUM PUSILLUM Nutt. Barley Grass. Apparently rare slender annual from dry, open slopes, 100–400 ft: Middle Ranch Canyon below Eagle's Nest, *Fosberg* S4666, Apr. 22, 1931, and S4706, Apr. 29, 1931 (LAM); Isthmus, *M. Jones*, May 29, 1927; dried pool of Soapstone Quarries above Parsons' Landing, *Fosberg* S4945, May 21, 1931 (LAM).

**HORDEUM VULGARE* L. Barley. Stout annual, probably from Eurasia, found infrequently along roadsides and in disturbed ground, probably not persisting, 90–1400 ft: Avalon, Hamilton, and Middle Ranch Canyons, along Airport Road E of Black Jack Mt.

**LAMARCKIA AUREA* (L.) Moench. [*Achyrodes aureum* (L.) Ktze.] Goldentop. Common Mediterranean annual over island on dry open slopes and ridges, disturbed ground, and weedy places generally, 25–2000 ft: Renton Mine, Lookout Point, Avalon, Gallagher's, Swain's, Middle Ranch, and Bulrush Canyons, Echo Lake, S slope Mt. Orizaba, Salta Verde, Little Harbor, above Empire Landing, Bird Rock, Cherry Valley, Parsons' Landing.

**LOLIUM MULTIFLORUM* Lam. Italian Ryegrass. Eurasian-North African annual or biennial, infrequent along coasts, 5–50 ft: Pebbly Beach, Descanso Canyon, Little Harbor salina, Isthmus Harbor.

**LOLIUM STRICTUM* Presl. European annual found once as roadside weed opposite Bird Park, Avalon, 100 ft, *Thorne* 36482, June 1, 1966.

**LOLIUM TEMULENTUM* L. Darnel. Infrequent Mediterranean annual of roadsides and orchards, 15–900 ft: Pebbly Beach, Renton Mine, Avalon Valley, Middle Ranch Canyon.

MELICA IMPERFECTA Trin. [prob. inc. *M. Torreyana* of Millsp. & Nutt.] Common erect perennial over SE half of island on dry, rocky slopes, ridges and bluffs, 25–1350 ft: Renton Mine, Lookout Point, Avalon Bay, Gallagher's, Swain's, Cape, Middle Ranch, Bulrush, and Cottonwood Canyons, Moonstone Cove, S slope Mt. Orizaba.

MONANTHOCLOE LITTORALIS Engelm. Stoloniferous, mat-forming perennial with wiry, tufted culms, known only from small salina inside Ballast Point on E side of Catalina Harbor at the Isthmus: *Fosberg* S4927, May 20, 1931 (LAM); *Blakley* 4729, Sept. 23, 1961; *Thorne* 34534, May 11, 1965.

MUHLENBERGIA MICROSPERMA (DC.) Kunth. Dropseed Grass. Delicate, purplish annual infrequent over island on dry, rocky slopes and sandy, dry stream beds, 25–800 ft: Hamilton, Middle Ranch, and Cottonwood Canyons, Salta Verde, bluff at White's Landing, Cherry Valley.

**PARAPHOLIS INCURVA* (L.) C. E. Hubb. [*Pholiurus incurvatus* (L.) Hitchc.] Sickle Grass. Mediterranean annual infrequent in salinas and beaches about island, rare inland in alkaline places, 5–200 ft: Pebbly Beach, Cottonwood Canyon Beach, Shark, Little, and Catalina Harbors, old quarry above Empire Landing, dried pools in Soapstone Quarries above Parsons' Landing.

**PASPALUM DILATATUM* Poir. Stout, clumped perennial from South America established in former lawn of razed St. Catherine's Hotel, Descanso Canyon, 15 ft, *Thorne* 36486, June 1, 1966.

PASPALUM DISTICHUM L. Knot Grass. Creeping perennial rooting at nodes, found only in a sandy, disturbed area behind Ben Weston Beach, 10 ft, *Thorne* 36653, Sept. 14, 1966.

**PHALARIS AQUATICA* L. [*P. tuberosa* L. var. *stenoptera* (Hack.) Hitchc.] Rhizomatous, clumped perennial, possibly from the Mediterranean, infrequently established about island where planted for forage, 10–1400 ft: Hay Press area, upper end Gallagher's Canyon, Hen Cove N of White's Landing, upper end Cape Canyon.

**PHALARIS CANARIENSIS* L. Canary Grass. Rare Mediterranean annual waif: dry salt marsh, Pebbly Beach, 2 m, *Fosberg* S4474, Apr. 3, 1931 (LAM); roadside weed opposite Bird Park, Avalon, 100 ft, *Thorne* 36481, June 1, 1966.

PHALARIS CAROLINIANA Walt. Rare annual, not recently collected on Catalina: canyon by stream, *Trask*, May 1897 (US); *Trask*, Mar. 1901 (US).

PHALARIS LEMMONII Vasey. Also rare annual not recently collected: "rare," *Trask*, May 1897 (US).

**PHALARIS MINOR* Retz. Infrequent Mediterranean annual about island on hillsides, rocky bluffs, salinas, washes, open fields, and waste ground, 5–200 ft: Pebbly Beach, Avalon, Little Harbor, Bird Rock, bluff near Catalina Harbor at Isthmus.

**POA ANNUA* L. Annual Bluegrass. Eurasian annual weed collected only from desiccated swale along roadside at Toyon Picnic Ground, Hay Press area, 1400 ft, *Thorne* 34663, May 11, 1965, and from roadside Middle Ranch Canyon, *Thorne* 36859, May 18, 1967.

POA SCABRELLA (Thurb.) Benth. ex Vasey. Malpais Bluegrass. Tufted perennial frequent about island on dry, rocky or grassy slopes, 25–1400 ft: Pebbly Beach, Avalon, Hamilton, Gallagher's, Toyon, Middle Ranch, and Cottonwood Canyons, White's and Parsons' Landings.

POLYPOGON INTERRUPTUS Kunth. Beard Grass. Common perennial in and along streams in canyons and in salinas of SE half of island, 10–1100 ft: Hamilton, Swain's, Cape, Middle Ranch, Bulrush, Cottonwood, and Fern Canyons, Ben Weston Beach, Little and Shark Harbors, etc. An obnoxious weed in No. 2 Reservoir in upper Middle Ranch Canyon, where growing in depths to 5 ft of clear water, rooted in muddy bottom.

**POLYPOGON MONSPELIENSIS* (L.) Desf. Eurasian-African annual frequent on SE half of island in salinas, along streams, and in other moist places, 5–1100 ft: between Pebbly Beach and Avalon, White's Landing, Swain's, Cape, and Fern Canyons, Ben Weston Beach, Little and Shark Harbors.

**POLYPOGON SEMIVERTICILLATA* (Forsk.) Hyl. [*Agrostis verticillata* of Millsp. & Nutt.] Mediterranean perennial with culms decumbent at base or creeping and rooting at nodes, established in Cape, Middle Ranch, and Cottonwood Canyons.

**SCHISMUS ARABICUS* Nees. Rare Asiatic annual weed found in two places: weedy area around Echo Lake, 1350 ft, *Thorne* 34453, May 10, 1965; grassy ridge top between Moonstone and White Coves, 100 ft, *Thorne* 36525, June 2, 1966.

**SECALE CEREALE* L. Rye. Asiatic annual collected only once, and apparently not persisting; orchard in Avalon Valley, 50 m, *Fosberg* S4555, Apr. 10, 1931 (LAM).

**SORGHUM BICOLOR* (L.) Moench. [*S. vulgare* Pers.] Old World annual volunteering along roadside near Bird Park, Avalon, 50 ft, *Thorne* 36696, Sept. 16, 1966. It is very doubtful that this species will persist.

**SORGHUM HALEPENSE* (L.) Pers. Johnson Grass. Old World perennial collected once and apparently not persisting: orchard in Avalon Valley, 45 m, *Fosberg* S4513, Apr. 8, 1931 (LAM).

STIPA CERNUA Stebbins & Love. Needlegrass. Apparently rare perennial bunch grass of dry, eroded, clayey or grassy slopes, 1400–1500 ft: near viewpoint E of Wrigley Reservoir,

Blakley 5530-A, Apr. 7, 1963; Hay Press area, *Thorne 36251*, Apr. 28, 1966; hillside along Airport Road before turn-off to Middle Ranch, *Thorne 36303*, Apr. 29, 1966. This grass may be more frequent than thus indicated for I was unable to distinguish it in the field from *S. pulchra*. In fact, I have considerable doubt that it is specifically distinct from *S. pulchra*.

STIPA LEPIDA Hitchc. Feather Grass. Common slender, tufted bunchgrass over island on dry, rocky slopes and bluffs, 30–1800 ft: Renton Mine, Avalon, Gallagher's, Swain's, Middle Ranch, and Cottonwood Canyons, S slope Mt. Orizaba, W of Empire Landing, Isthmus, Cherry Valley.

STIPA PULCHRA Hitchc. Needlegrass. Frequent clumped perennial on dry, rocky slopes and ridges, 30–1400 ft: Renton Mine ridge, Hamilton, Gallagher's and Toyon Canyons, Bulrush Ridge, Little Harbor, rocky slopes 1 mi W of Empire Landing.

POTAMOGETONACEAE (incl. RUPPIACEAE)

**POTAMOGETON CRISPUS* L. Pondweed. European submersed aquatic found once in small colony near earth dam in shallow water with *P. pectinatus*, Cape Canyon Reservoir, 1100 ft, *Thorne 36493*, June 1, 1966.

POTAMOGETON FOLIOSUS Raf.(?) A few sterile plants, probably belonging to this submersed species, were collected in shallow water and on mud at edge of Hay Press Reservoir, 1350 ft, *Thorne 34978*, June 23, 1965. No further material was found on subsequent visits to the reservoir.

POTAMOGETON PECTINATUS L. Sago Pondweed. Submersed, rhizomatous aquatic infrequent in shallow water of stream pools and reservoirs, 100–1430 ft: Middle Ranch and Cottonwood Canyons, Hay Press, Cape Canyon, and Buffalo Springs Reservoirs.

RUPPIA MARITIMA L. [*R. spiralis* L. ex Dum.] Ditch-grass, Widgeon-grass. Submersed, rhizomatous aquatic, infrequent in shallow water of stream pools, brackish lagoons, and ponds, 5–425 ft: Middle Ranch and Cottonwood Canyons, Little Harbor, Soapstone Quarries near Parsons' Landing. I think the plants with elongating, spiraling or flexuous peduncles constitute merely a genetic variant.

TYPHACEAE

TYPHA DOMINGENSIS Pers. [*T. angustifolia* of Millsp. & Nutt.] Cattail. Tall rhizomatous perennial infrequent in shallow water or wet mud of streams and ponds, 125–1450 ft: lower Middle Ranch and Cottonwood Canyons, small stream running into lower Buffalo Springs Reservoir, Soapstone Quarries above Parsons' Landing.

TYPHA LATIFOLIA L. Tall, rhizomatous perennial established in lower Middle Ranch Canyon: shallow running water of stream, 300 ft, *Thorne 34954*, June 23, 1965; small desiccated marsh behind dunes at Ben Weston Beach, 10 ft, *Thorne 36642*, Sept. 14, 1966.

ZOSTERACEAE

PHYLLOSPADIX SCOULERI Hook. Surfweed, Surf-grass. Collected only at Little Harbor and near Black Point but probably much more frequent and locally abundant on shoreline rocks below tide level than these few collections would indicate: S side of N beach of Little Harbor, *Thorne 34562*, May 11, 1965; in wrack on beach, Little Harbor, *Thorne 36443*, May 31, 1966; attached to boulders amid kelp and *P. torreyi* in about 3–4 ft of water at low tide, near Black Point, N side W end of island, *Thorne 36687*, Sept. 15, 1966.

PHYLLOSPADIX TORREYI S. Wats. Infrequently collected, but locally very abundant, submersed perennial attached to rocks below tide level about island: Jewish Point, Little Harbor, Bird Rock, Catalina Harbor near base of Ballast Point, near Black Point on N side W end of island. As with preceding species, a careful survey of the underwater vegetation around the island would probably show the surfweeds to be common and abundant.

ZOSTERA MARINA L. Eelgrass. Discovered by Robert R. Given and Dennis Lees growing in about 20 ft of water in Catalina Harbor near base of Ballast Point, forming false bottom just above bottom mud, *Thorne 36688*, Sept. 15, 1966. Also cast up on beaches at Avalon, *Thorne 33440*, Feb. 7, 1964; and at Ben Weston Beach, *Fosberg S4750*, May 4, 1931 (LAM); and found floating in the Pacific Ocean 100 or so m off the Palisades, S end of island, *Thorne 36714*, Sept. 17, 1966.

STATISTICAL SUMMARY OF THE VASCULAR PLANTS OF SANTA CATALINA ISLAND

	INDIGENOUS			NATURALIZED		
	Families	Genera	Species	Families	Genera	Species
Pteridophytes	6	11	15	0	0	0
Dicotyledons	59	191	320	7	62	125
Monocotyledons	9	34	58	0	17	41
<i>Totals:</i>	74	236	393	7	79	166
<i>Grand Totals:</i>						
	Families	81				
	Genera	315				
	Species	559				

LARGEST FAMILIES (Native + Naturalized Species)

Asteraceae	60 + 29	Rosaceae	11 + 2
Poaceae	31 + 39	Hydrophyllaceae	11 + 0
Fabaceae	30 + 13	Polemoniaceae	9 + 0
Scrophulariaceae	14 + 1	Caryophyllaceae	8 + 7
Chenopodiaceae	13 + 9	Polygonaceae	7 + 4
Boraginaceae	13 + 0	Lamiaceae	6 + 4
Brassicaceae	12 + 16		

LARGEST GENERA (Native + Naturalized Species)

Lotus	10 + 1	Baccharis	5 + 0
Atriplex	8 + 3	Cryptantha	5 + 0
Trifolium	8 + 1	Mimulus	5 + 0
Quercus	7 + 0	Phacelia	5 + 0
Gnaphalium	6 + 1	Festuca	4 + 2
Lupinus	6 + 0	Euphorbia	4 + 1
Bromus	5 + 4	Hordeum	2 + 4
Opuntia	5 + 1		

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